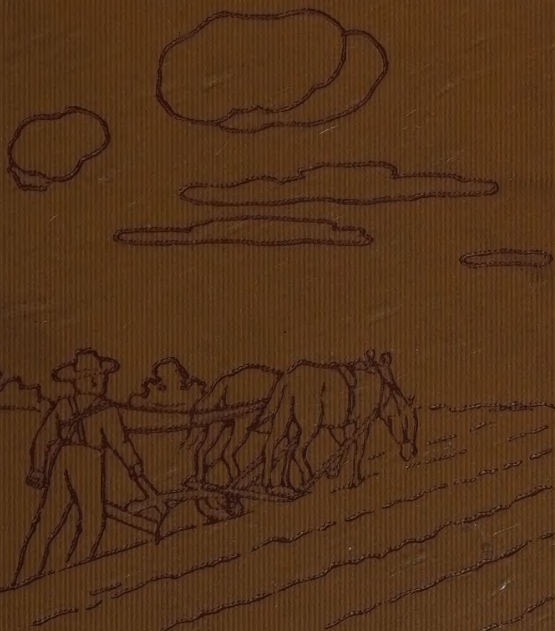
READERS ON COMMERCE & INDUSTRY

HOW THE WORLD IS FED

FRANK GEORGE CARPENTER



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READERS ON COMMERCE AND INDUSTRY

HOW THE WORLD IS FED

BY

FRANK GEORGE CARPENTER

AUTHOR OF CARPENTER'S GEOGRAPHICAL READERS

NEW YORK · CINCINNATI · CHICAGO

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CARP. WORLD IS FED.
E. P. 8

PREFACE

THIS book on Foods is the first of a series upon the great industries of the world. Its purpose is to give the children a knowledge of the production and preparation of foods, and to show how civilization and commerce grew from man's need of foods and the exchange of foods between the different nations of the earth.

The author takes the children on personally conducted tours to the great food centers of the world, to the markets of exchange, to the factories, the farms, the forests, and the seas.

Together they visit the great wheat fields of our own and other lands. They follow the grain to the mills and from the mills to the markets. They go through the corn belt of the United States and learn the size and value of our corn crop. They visit the rice countries of the world and learn how this grain, which forms the bread of a large part of the human race, is grown and prepared for the market.

They go to a western cattle ranch and aid the cowboys in a "round up." They follow the cattle to a great packing center, where they inspect the stock yards and observe the killing and shipping. They also learn how pork is packed for shipment to all parts of the world. They live for a time with the shepherds in Australia and New Zealand, and visit the factories to observe the handling and freezing of mutton.

Visits are paid to dairy countries, and the manufacture of butter and cheese is explained. The children go to the poultry yards of the world and are shown how chickens,

ducks, geese, and turkeys are reared, and what an important part of our national income our egg industry produces.

They are taken with the fishermen of different lands to the great fishing grounds to observe how salmon and other finny creatures are caught and prepared for the markets.

Several interesting trips are taken to the vegetable gardens of the world, and the children learn that many vegetables have histories and have long held important places in furnishing food for man.

Journeys are made to orchards and vineyards when apples, peaches, berries, oranges, pineapples, bananas, and grapes are ripe, and the luscious fruit is picked and eaten fresh from the trees and vines. Also tours are made to the lands of the olive, date, and fig, and the children taste the many other curious fruits of tropical lands.

With the author they take passage on a steamer at New York and sail to the warm coffee lands of Brazil. Here they watch the picking of the coffee beans and the different processes used in the preparation of the coffee of commerce. They then make a flying trip to Japan to see how tea is picked, dried, and boxed for shipment.

A peep is next taken into the world's big sugar bowl, and the children learn how the chief commercial sugars are made from beets or sugar cane.

This Food Reader is, to a large extent, the result of the personal observations of the author. Many of the descriptions were written on the ground, and great care has been taken to make every part of it as accurate and up to date as possible.

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FOODS: OR HOW THE WORLD IS FED

1. INTRODUCTION

WE start to-day upon a series of travels which will take us all over the earth. Our object is to learn about the foods of the world and how they are used by man. In our journeys we shall visit the farms of many nations and see how the crops are raised. We shall go into the orchards and pick apples, oranges, and other fruits fresh from the trees. We shall penetrate the wilds to hunt the game which man eats; and we shall even look into the seas and study the fish, oysters, and other animals which live under the water.

As we go on with our travels, we shall see ships and cars carrying food from place to place; and, in the markets, we shall watch the exchanges of one thing for another. This will show us the commerce of the world as it affects our eating; while the work on the farms and in the orchards and the factories will show us the great industries which have grown up in raising food and preparing it for use. Indeed, all our journeys are to be along the lines of industry and commerce. They will deal with the world at work and the world of trade.

We all know that man is an animal, and, whenever we miss our meals, we realize that he is a hungry animal. Men

seldom work except to satisfy their wants; and their wants along food lines are such that they devote the greater part of their lives to supplying them. Indeed, the story of the growth of the easier ways of satisfying these wants forms a large part of the history of civilization. Ages ago men ate their food raw. If they killed a wild animal, they tore it to pieces and devoured it. Some savage tribes do this to-day. The Australian aborigines, for instance, know but little about cooking, and a part of their food is worms, which they dig from the trees and eat raw. The Abyssinians eat raw meat, and there are other Africans who live largely upon roots, wild vegetables, and fruit. Some of these people are not much better than the savages of the distant past.

It was some time before men learned that food is better when cooked. How they found out we do not know. It may have been like the discovery of roast pig by Bo-bo, the Chinese boy, as told by Charles Lamb. Bo-bo was the son of the swineherd, Ho-ti, and, as you may remember, he accidentally set fire to his father's house, in which some little pigs were kept. The house burned to the ground, and the pigs were roasted. Bo-bo felt one of the sizzling carcasses to see if it might not still have life; and, as it burned his fingers, he thrust them into his mouth. His pain turned to delight as he got his first taste of the juicy cracklings which adhered to them. He told Ho-ti, and, as the story goes, the two burned down house after house to get more roast pig. They were arrested, and at their trial some of the roast was given to the judge. A few days later the judge, having bought some little pigs of a neighbor, burned his own house. Others did likewise, until a sage discovered

that a pig could be roasted on an ordinary fire, and after this, roasting became common throughout the nation.

However true this story may be, we know that roasting was the first stage of food preparation, for it is common among all savage tribes. The next discovery was probably baking. Holes were made in the ground and lined with stones. Fire was then built, and when the stones were red-hot, the food, wrapped in leaves or skins, was there covered up to be cooked. Such bake ovens are common to-day in the islands of the South Seas, and dressed pig or other animals are thus deliciously cooked.

The savages of Africa cook hippopotamus and elephant meat in stone-lined pits made red-hot by fire; and a delicious morsel to them is an elephant's foot placed in such a pit and allowed to remain until done.

Boiling and steaming food came later. Our Indians sometimes cooked in this way, and one tribe of them, the Assiniboins, were known as the stone boilers, because they boiled their food with red-hot stones. Having killed a buffalo, they took off its skin and so fitted it into a hole in the ground that it was perfectly tight. They next poured water into the skin and placed pieces of the buffalo meat within it. Then, having made a fire near by, they heated great stones red-hot and tumbled them into the water. In time the water boiled, and the meat was cooked.

There are places on the earth where nature herself furnishes plenty of boiling water and steam. The Yellowstone Park, for instance, has boiling springs in which one can place a basket of eggs and have them cooked hard or soft, according to the time they are left in, and into which one can drop fish and bring them out ready to eat. In the Hot Springs

region of New Zealand there are pools of water which are always boiling, and also many wide cracks where the steam pours forth from the ground. Here Mother Earth does the cooking. The natives have steaming boxes with only network of ropes for a bottom. They put the food into

Here Mother Earth does the cooking.

the boxes and set them over the steam holes or cracks. In a short time the food is cooked quite as well as in our own steamers.

In one way or another, as time went on, the people of the world learned more about cooking. Their desire for different kinds of food and more food led them to trade with each other. Each learned what the others had discovered as to food getting, food keeping, and food manufacturing. They began to exchange foods; and through such exchanges, grew up what we call civilization and especially commerce.

Our food now comes from all parts of the world,

and our dinner tables have articles upon them which were brought thousands of miles for our use. The tea we drank to-day may have been picked by a Chinese boy or girl last year, and the sugar in it may have come from cane raised in Cuba. The coffee was grown on bushes in southern Brazil, and, if we could follow the pepper back to its home, we might find half-naked little brown boys of Java or Sumatra playing among the vines on which it grew. If the loaf of bread could tell its story, it might speak of vast fields of golden wheat beyond the Great Lakes; and the roast beef, only a few weeks ago, was part of an animal which galloped over the Texas prairies, with a cowboy behind it.

Every meal we eat, in fact, has been brought to us from many parts of the earth, and the people who furnished it are probably eating some things supplied by us. In this way the whole world is working for you and me, and we, in turn, are working for every nation which buys the things we make or raise to sell.

It is thus through commerce that food is carried all over the world, from the places where each kind can be raised the cheapest, and sold for money in exchange. As we proceed with our travels, we shall see that almost every locality produces some things better than others, so that a continual exchanging goes on, and cars and ships are always moving this way and that, carrying food products from country to country, and from place to place.

We ship quantities of food abroad every year and compete in the markets of the world with all other nations which have similar things to sell. In our travels we must study this globe as a workshop and as a vast retail store.

We must learn not only what we ourselves produce to eat and sell, but also what other nations raise and what they have to sell in competition with us. We want to know which nations are our chief customers and what they send back to us in money or goods in exchange.

2. THE BREAD OF THE WORLD — WHEAT

BREAD is used more than any other food by civilized man. The Bible calls it the staff of life; and raising the grains which supply it is one of the world's chief industries. The principal grains are wheat, corn, oats, rye, barley, and rice. In our country more wheat and corn are used than any of the other grains. In some parts of Europe the people eat a black bread made of rye, and in others they live largely upon ground oats. In Asia and Africa some of the natives make bread of millet and in some countries rice forms the chief food, being cooked whole, or ground to a flour for bread or cake.

All these grains are the seeds of different grasses. They are called cereals, from Ceres, who was worshiped by the Romans as the goddess of the harvest. Each grain grows best in certain places and climates. Some grains thrive better in the United States than anywhere else. We raise more wheat than any other nation and more corn than all the rest of the world put together. Our total crop of cereals for one year sometimes weighs ninety million tons and is worth fifteen hundred million dollars. The product is so enormous that we cannot realize it.

Let us take our pencils and see what it would amount

to if it were loaded upon freight cars, joined end to end in one long train. We shall suppose that each car holds twenty tons, and that it will take forty feet of space on the track. Dividing the ninety million tons by twenty gives us four and a half million, the number of cars required to carry the grain; and multiplying that number by forty, the number of feet to each car, shows us that the train would reach to a distance of one hundred and eighty million feet from its starting point. Now five thousand two hundred and eighty feet make a mile; and, dividing by that, we find that our train of grain would have to be more than thirty-four thousand miles long, or long enough to reach around the earth at the Equator and leave enough cars over to fill three continuous tracks from New York to San Francisco.

Heads of wheat.

A large part of such a train would be loaded with wheat, and that part would be more valuable, in proportion to its

length, than any other. Wheat forms the chief food of about one third of the human race. It is the principal breadstuff of civilized man; and it has been used for food so long that no one can tell who the first wheat eaters were. We know that the Egyptians raised wheat in the valley of the Nile about the time that the Pyramids were built, for on the tombs near by are paintings of men reaping and threshing the crop; and we find wheat mentioned as food again and again in the Bible.

Mills for wheat grinding and ovens containing loaves of baked bread were found when the city of Pompeii was uncovered. That city had been buried by the lava and ashes of Vesuvius only a few years after Christ was born. At that time, we know from this discovery that the Romans were eating wheat. The Chinese have a tradition that wheat came to them direct from Heaven. They say that their ancestors were growing it more than four thousand years ago; and to-day it is one of the grains planted by the emperor when he starts the spring plowing for his nation.

Wheat has always been one of the chief foods of modern Europe. It was brought to America by our forefathers. George Washington was a noted wheat farmer in his day; he had a mill at Mount Vernon and exported flour to the West Indies.

As time went on, wheat was raised by our pioneers on the new lands farther west. For a while New York produced a great part of the crop. Then Ohio, Kentucky, Illinois, and Michigan became the chief wheat states, and, a few years later, King Wheat drew on his seven-league boots and crossed the Mississippi. He trod northward and conquered Minnesota and the Dakotas, which are now

amongst our richest grain-growing states, and then marched over the Rocky Mountain plateau and extended his realm to California, Oregon, and Washington.

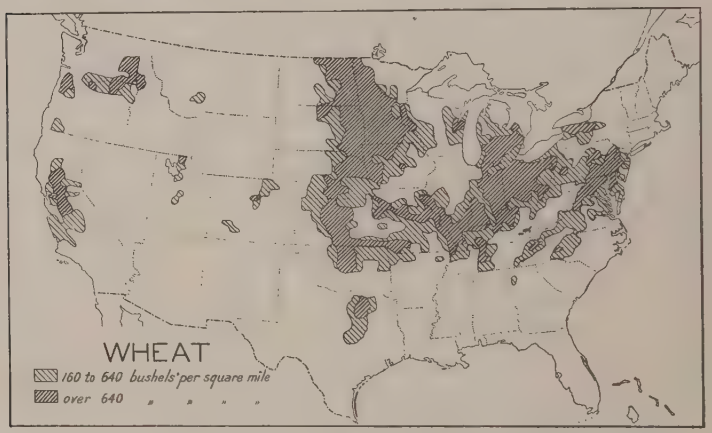
Our wheat is of many varieties, each of which grows best in certain localities. In some kinds the kernels are white and in others red or amber. Some wheat grains are large, others small; some are heavy and some light. The most of the wheat of the upper Mississippi Valley is spring wheat; that is, it is planted in the spring and harvested in the fall. In other parts of the country winter wheat grows better. Such wheat is planted in the fall and harvested in the early summer. Spring wheat is excellent for bread making, and it yields more bread to the barrel of flour than winter wheat. The winter wheat contains more starch; it also makes good bread and is especially desirable for pastry.

In some parts of the United States we raise a hard wheat which looks somewhat like barley. It is called durum and is excellent for macaroni. It grows upon our high, dry lands, where other varieties do not thrive. We raise much of it for our own use and ship a great deal to Italy, southern France, and other countries, where macaroni largely takes the place of bread.

To-day wheat is grown in many parts of the United States. The bulk of the crop comes from the north central part and the Pacific Coast, but wheat is raised in forty-three different states and territories, and in many of them it is the most important crop. In one year we have produced more than seven hundred and eighty million bushels, enough to furnish half a bushel to every man, woman, and child upon earth. We are now growing more wheat than

any other nation, more than we can consume, and so much that we send a vast deal to other peoples in different parts of the world.

Much of our wheat in the Eastern and Central States is grown on small farms. Each farmer has one or more fields of five, ten, or perhaps fifty acres in wheat, and other fields devoted to other crops. In parts of California, in



Wheat districts of the United States.

the Red River Valley, which runs from Canada down between Minnesota and North Dakota, and in western Canada, as well as in some other regions, the soil is so good for wheat that many farmers raise nothing else. In such places wheat is raised on a vast scale, a single estate employing hundreds of horses and men. There is a ranch in California, for instance, which contains ninety thousand acres, and another in North Dakota which has seventy thousand. In California one field of forty square miles has been planted in wheat. That field is so large that one

man would have to work steadily for sixteen years to prepare it for planting, if he did it in the old-fashioned way; and it would require the labor of many years more for him to sow and harvest it all, if this were possible. Such farming, however, is easily accomplished by modern machinery. The planting is done by a small army of men with plows and drills, and the harvesting

Sulky plow.

by several hundred steam reapers and threshers, each of which may harvest seventy-five acres in a day.

But we shall see this better in the wheat fields themselves. Let us suppose that we are on one of the big farms of the Red River Valley. It is so large that we could ride about it for days and not see it all. It is managed like a great factory. It has hundreds of men working in companies, with foremen over them. It has offices where the books are kept, blacksmith shops where the machinery is repaired, and great stables for its horses.

Some of the fields contain five hundred acres or more. At planting time forty or fifty men move across a field, each driving a sulky plow. Each sulky has from three to six horses to pull it; it has two plows below it which cut two furrows as it goes. After the plowing is finished, other men ride behind upon disk harrows which grind the earth fine, and behind them come others driving machine drills which drop the wheat into the soil. These drills are long boxes filled with wheat and mounted upon wheels.

Steam plow.

Each has a row of holes in the bottom, from which slender tubes run down to the ground. Each tube will let out the grain just as fast as it is needed; and behind each tube is a little plow, which follows and covers the grain as it drops. A long line of such drills will soon plant a great field. Sometimes traction engines take the places of horses in doing this work. One great engine will draw a line of plows, with harrows behind them, and still farther back the drills which sow the seed.

On a farm like this the work goes on systematically. The overseers keep every man moving. The brown sod is turned, and the black soil covers the wheat. Each grain is laid away in its little nest in the ground. It soon sprouts, and, by and by, the farm is covered with what looks like green grass. This grows rapidly, aided by the rain and the sun. Within a few months it is as high as your waist. Now each green stem bursts out at the top into a head filled with seeds. The seeds are soft and milky at first. They grow harder and harder as the wheat ripens, and after a while the tall green stem turns to pale yellow. It becomes more yellow as the sun continues to shine upon it, and the seeds of grain in the head turn yellow, too, inside their yellow husks. Now the heads begin to bend over, and the farmer knows they are ready for harvest.

The wheat is ripe at the time of our visit to this great farm in North Dakota. On all sides of us, as far as our eyes can reach, the golden grain is rising and falling under the wind like the waves of the sea. We have been riding for days on our horses, with wheat on both sides of us; and we might go on for days to come, seeing nothing but wheat, wheat, wheat. In many places they have begun to harvest the crop. We can see the smoke from the steam threshing machines rising here and there over the grain, and the long lines of reapers, drawn by horses, which are cutting it off close to the ground and binding it for the threshers. On several of the farms we have passed were machines moved by steam engines, which thresh the wheat as they cut it and put it into sacks ready to be carried to the elevators or cars. In other

Long lines of reapers.

places only the heads of the wheat are cut off and threshed, the straw being left on the field.

Threshing machine.

Our method of harvesting is far different from that employed in other parts of the world. On some Russian farms the grain is still cut with sickles and scythes, just as it was in old Egypt in the days of the Pharaohs; while on others our modern machinery is used. In some wheat countries the grain is threshed out by laying it on the hard ground or barn floors and pounding it with sticks and flails, as was done long ago in different

parts of our country. In Turkey and along parts of the lower Danube the wheat is trodden from the husks by laying it on threshing floors and driving cattle or horses over it. The feet of the animals press the grain out, and the powdered straw, or chaff, is thrown by hand into the air against the wind to clean it. The wind carries away the chaff, and the wheat drops to the ground. In China wheat is often so winnowed, the threshing being done by boys who ride blindfolded buffaloes about over the straw.

With such methods, it would be impossible to harvest our enormous wheat crop. We must have machinery to take the places of men and animals; and we are continually inventing new things by which steam does more and more, and man less and less. One of our large threshers will do the work of hundreds of buffaloes or oxen, and of thousands of flails. Indeed, a single threshing machine sometimes hulls out more than one thousand bushels of wheat in a day. The ripe wheat pours into it, like a great golden river; the husks, chaff, and straw are torn off and carried away in another stream; while the clean white grain flows out through pipes at the sides so fast that it keeps several men busy holding the bags, that all may be caught. In such places the wheat is often not bagged at all. It falls into the wagons, which carry it to the elevators or grain storage houses at the railroad stations, or direct to the cars, which transport it in bulk to the vast elevators of the milling centers, markets, or ports.

In handling a crop like this, machine labor is always cheaper than hand labor; and every effort is made to

reduce the cost by reducing the work of man. It has been estimated that it took nineteen times as much hand labor to produce a bushel of wheat before our planting, reaping, or threshing machines were invented as it does now. An equally great, or greater, saving is made in the machinery by which we transport the grain to the seacoast and across the water to other countries. It is largely by our machinery that we are able to compete successfully with the other nations, who raise and handle their wheat in the more expensive, old-fashioned ways.

3. HOW OUR WHEAT IS MARKETED

WE have left the wheat fields and are following the grain to the markets. Every town we pass through has its elevator, where the grain is stored until it can be sent off by train. The ungainly building rises high above the rest of the landscape. There are wagons about it and loads of wheat waiting for storage.

The railroad tracks are filled with cars, and long trains of wheat are continually moving on toward the east and the south. Some are bound for the flour mills of Minneapolis, and some for the Mississippi River, down which the grain will float in huge barges to the Gulf of Mexico, on its way to South America or Europe. Other trains are moving toward the head of Lake Superior, where the steamers will carry the grain on down through the Great Lakes to Chicago and Buffalo, and from Buffalo by the Erie Canal to New York. Some of the ships will not go to Buffalo, but will pass through the Welland

Canal to Lake Ontario and by the St. Lawrence River out to the Atlantic and across to Europe. A vast deal of wheat goes east by rail from Chicago, and another great quantity from the wheat fields of the Mississippi

Every town has its elevator.

Valley to New York and our other Atlantic ports, and thence on to Europe.

During the wheat harvest this grain pours into almost every one of our great shipping centers. It flows from the farms to the railroads, and from the railroads to the lakes and rivers, and on to the oceans. Much winter wheat goes to St. Louis for export or to be made into flour. Both spring and winter wheat flow into Chicago and New York. On the Pacific Coast the streams of

golden grain move from the fields into San Francisco, Portland, or Puget Sound, and there divide, a part being redistributed for home consumption, and another great part going in some of the largest ships of the world to Japan, China, Siberia, and the islands of the Pacific. Some of this crop is unloaded to feed our cousins in

Pacific Coast wheat stored in bags.

Hawaii, and a small portion goes by way of Hong Kong to the Philippine Islands. Much of our Pacific Coast wheat is stored in bags, and at harvest time these are piled up at the stations by thousands.

Our wheat traffic is so enormous that it is almost impossible for one to appreciate it. As we have already learned, our crop in a single year sometimes amounts to more

than seven hundred million bushels, and every bushel must in some way or other be taken from the fields to the markets. If all this grain were loaded upon wagons and hauled by two-horse teams at a ton to the load, allowing each wagon and its horses about thirty feet on the roadway, it would require a wagon train more than one hundred and twenty thousand miles long to carry it all. We can easily figure how many times such a train would extend around the world and what an army of wagons it would make if it were stretched back and forth across the United States between the Atlantic and the Pacific Oceans.

But what becomes of this mighty wheat crop? We need the greater part of it for ourselves. We require almost five bushels per year for every man, woman, and child in our country, and this demand must be supplied before we can think of shipping wheat abroad. It takes more than four hundred million bushels of wheat for our own needs, and this amount goes to our mills to be ground into flour.

In addition, we have to save a great deal for seed, and notwithstanding this, we have somewhere between one hundred and two hundred million bushels, and even more in good seasons, left for export to the different nations of Europe, Asia, South America, and Africa. This part of our crop is sent abroad both as grain and as flour.

Let us stop a moment and think what the carrying of our wheat to these distant countries means. A bushel of wheat weighs sixty pounds, or as much as many a ten-year-old boy. It makes quite a big bundle; and, if one should be asked to carry it upon his back to any place a hundred

miles from his home, he would want a large sum. But most of our wheat must be taken more than a thousand miles by train to the seacoast, before it can start on its long ocean voyage. It must be transported so cheaply that it can compete with other wheat in the world's markets, and so cheaply that the people of other nations, the most of whom earn less than we do, can afford to buy it.

This would not be possible unless almost the whole of the work could be done by machinery. The cost of carrying it on trains and vessels has been made so small that a bushel of wheat is sometimes taken from New York to Liverpool for as little as two cents, and it may be carried on the railroad from Chicago to New York for five cents, or even less. The loading and unloading is done with but little hand labor. Indeed, the grain is hardly touched by man after it leaves the wheat fields, until it reaches the land of the consumer.

We stop at one of the ports to take a look at the elevators through which the grain passes on its way from the cars to the ships. These buildings are wonders of modern machinery. They are as tall as a twelve-story house. Some of them look like great barns; others are groups of steel bins surrounded by brick walls; these are fireproof and have no crevices. Above the tanks, or in the top of one of the elevators, is the hoisting and other machinery which moves the grain in and out.

There are many elevators at every great wheat-shipping center, and all together they will store vast quantities of grain. Our wheat crop is harvested within a few weeks, and much of it must be stored for a time before it can be sent on to the market. Some of the elevators are so big

that each will contain several million bushels at a time, and their machinery is such that one can load and unload many thousand bushels per hour. At Port Arthur, Canada, is an elevator which holds seven million bushels of wheat, or enough to supply bread a whole year for a city of fifteen hundred thousand people.

The grain is brought to the elevator in bulk. It is taken from the cars in steel buckets fastened to a belt, which carry

The great Port Arthur elevator.

it to the top of the elevator and there empty it into great bins. When a bin is full, the weight of the grain is registered by machines, a door in its bottom opens, and the grain pours out through pipes into the tanks or storage rooms below. From the bottom of these storage places there are long spouts or legs which can be thrust into the hold of a steamer. When the spouts are opened, the grain pours through them until the ship is full. The vessel is unloaded by buckets on belts, and the machinery is such that a great steamer holding two hundred thousand bushels can be unloaded within three hours.

4. THE WHEAT OF OTHER LANDS

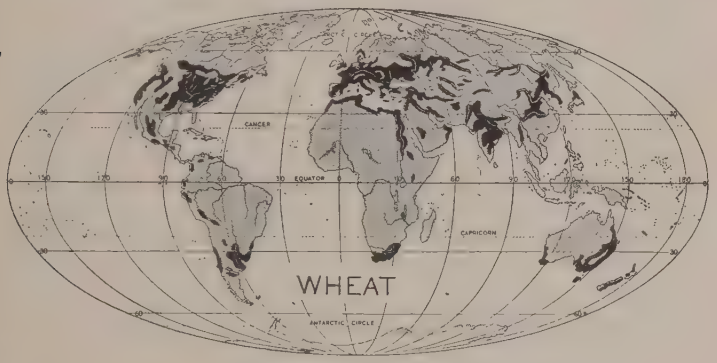
THIS morning we shall go outside our own country and see what other nations compete with us in raising wheat to sell. Our wheat lands are extensive, but they are by no means the only ones upon earth. The wheat crop of the whole world usually ranges between two and three billion bushels per annum, varying greatly according as the seasons are good or bad. Of this amount, about four fifths are produced outside the United States. During a recent year, when our crop was over seven hundred million bushels, Canada produced about ninety million bushels, and the whole North American continent eight hundred and forty-seven million. In that year Europe raised almost twice as much, and Asia just about one half as much, as the United States; while South America, Africa, and Australasia, combined, had about as much wheat as the continent of Asia.

The world's wheat crop.

In Europe the black plains of central and southern Russia and the plain that slopes to the North Sea and the Baltic produce most of the wheat, although a great deal comes from the valleys of the Danube and the Po. The chief wheat-growing states of Europe are Russia, France, Germany, Italy, Austria-Hungary, and Roumania. In South America the most of the wheat comes from the Argentine Republic, although Chile, Uruguay, and southern Brazil are wheat raisers. Canada is rapidly advancing as a grain-growing country, and it has vast areas between

the Great Lakes and the Rockies which will produce excellent wheat. It now grows many millions of bushels annually, and it may some day be one of our principal competitors in the wheat markets of Europe.

In Asia the chief grain fields are in India and in Asiatic Russia. Northern China gives a small share of the



Wheat regions of the world.

product, and in time southern Siberia may be one of the chief wheat countries of that part of the world. An excellent hard wheat is grown in Algeria; and other wheats are raised on the highlands of southern Africa; while Australia and New Zealand are both producers of excellent wheat. Indeed, wheat is the most important of all crops in the temperate parts of the globe. It is a world crop and has a world market, to which most of the more important wheat-raising countries send a part of their grain for sale.

The market for our wheat is best among the highly civilized nations. It forms the chief food of Europe, North and South America, and Australasia. It is fast

growing in favor in many parts of Asia and Africa, and we are now sending wheat and flour by the ship load to China and Japan.

The chief wheat market of the world, however, is Europe. Almost every nation of that continent uses wheat; and, although Europe grows more than half of all the wheat of the world, she annually buys hundreds of millions of bushels to fill her own bread basket. Some of the European countries, such as Russia, Austria-Hungary, and those along the lower Danube, produce more than they need. France and one or two other countries have just about enough for their needs; but in the other localities much of the food must come from outside, the people finding it more profitable, owing to the advantages they have through their mines and other resources, to engage in manufacturing or in raising other things to sell. Great Britain, although she once exported wheat, does not now yield enough to supply her people with bread for three months of the year. She has become a vast factory and brings in the greater part of her food from abroad. It is the same with busy little Belgium, who, owing to her coal and iron mines, can make more by manufacturing than by farming; and it is fast becoming so with Germany, who buys more and more wheat every year. The bread of Holland, Switzerland, and of Norway and Sweden largely comes from other nations; and the same is true of Spain, Italy, and Greece. These European countries all together annually require four or five hundred million bushels of wheat in addition to what they raise themselves; and this must come from other nations, or their people would suffer.

The chief wheat buyer of the world is the United King-

dom of Great Britain and Ireland. To meet her demand for wheat and flour, in a single year, almost two hundred million bushels of grain are sometimes required. She uses so much that she fixes the price of wheat in the world's markets, each of the chief wheat-raising nations sending a large part of her surplus to England. That country is by far our best customer. She buys several times as much wheat and flour of us as of any other country, our chief competitors being Russia, India, Canada, and Argentina.

But let us take a flying trip to some of the other wheat lands of the globe. We need not worry about the season. This grain is so widely scattered that it is sown and reaped somewhere every month, all the year round. In June, when we are harvesting it in California and our Southern States, the harvest is going on in Turkey, Spain, and south France. In July, when we reap it in the states farther north, it is also falling under the knives of Canada, Germany, France, Switzerland, southern Russia, and the basin of the Danube. In August it is harvested in Holland and Denmark, Great Britain, Poland, and in western Canada and the Dakotas; while in September and October the same work goes on in the Scandinavian Peninsula and in northern Russia and Scotland.

One would naturally think that the harvest must now stop, during the cold months of our winter and spring. But we remember that the seasons change as we cross the Equator, and that the lands south of it have summer when we have winter. In November the wheat is ripe in Peru and South Africa; in December, in Burma and northern Argentina; and in January, in lower Argentina, Chile, and Australasia. In February and March it is harvested in

east India and middle and upper Egypt; while in April the natives of lower Egypt, Asia Minor, and Mexico are reaping it, as are also, a month later, those of central Asia, China, and Algeria.

But let us suppose that we have left the United States and are traveling through the great plain south of Moscow. We are in the granary of Russia, in the midst of one of the chief farming populations of the globe. How different from our bread lands at home! There are no fences marking the fields; there are no houses or great barns standing alone on the landscape, but, instead, collections of thatched huts which straggle along each side of an unpaved road, each such collection forming a farm village. The people here do not live on their farms, but in these villages, and go out from them to work in the fields. Many of the lands are owned, not by individuals, but by all the people of a village in common. They go out together to plant or harvest the crop. A man is chosen as the overseer of each working party, and the women and girls labor side by side

Russian sowing wheat.

with the men and boys. After the crop is gathered, it is divided, a portion being stored away in the village granary for seed or to provide against famine.

In most parts of Russia the farming methods are so poor that, although the land is good, the average yield of wheat is only about ten bushels per acre. The earth is little

Reaping wheat in Asiatic Russia.

more than scratched by the plow, and the grain is cut with sickles or scythes. In other places modern machinery has been introduced, plows like our own are fast coming in, and reapers and threshers of American make have taken the places of the old-fashioned harvesting tools. This is so even in the Caucasus, Siberia, and other parts of Asiatic Russia, camels sometimes being used to drag the reapers through the ripe grain. The extent of the Russian wheat lands is enormous, and the crop is such that vast quantities of it are shipped abroad. Most of the Russian peasants eat bread made of rye. With the new and better

methods of farming, Russia will probably produce more and more wheat for the markets of Europe.

Our next trip is on the continent of Asia. We are in east India, a land which, in good seasons, produces almost one twelfth of the wheat crop of the world. The grain is grown chiefly on the high plateaus and especially in the

Reaping with knives in east India.

far northern parts of the country, where the winters are cold. It is raised mostly upon small farms, the average holding of all India being less than five acres. Here the farmers are black or dark brown, and many of them wear turbans while at work in the fields. Most of them live in villages of huts built of mud or sun-dried brick, and go out to their work. Some own their own lands, but more are tenant farmers, and millions work on the farms for a few cents a day. It is their low wages and their few wants that enable the east Indians to compete with us in the wheat markets of the world.

Their methods of farming are rude. Their plows are so light that they often carry them to the fields on their shoulders; and they cut the grain with sickles and scythes. It is then threshed out with oxen and winnowed in the wind. In some parts of India the wheat farms are irrigated. Such lands usually produce excellent crops, although the average for all India per acre is less than that for Russia or for any other of the world's great wheat countries.

In Argentina the wheat farms are largely along the eastern rivers, or where the crop can be cheaply shipped to the Atlantic. Much of the country is flat, and it has railroads which give the farms easy access to the ports. The Rio de la Plata is a wide and deep waterway, up which the grain steamers sail for many miles, to load wheat for the markets of Europe. Let us suppose we have left New York and sailed across the Equator, to the Rio de la Plata, and up that mighty river and on into the Parana to the city of Rosario, on its west bank. We have passed wheat fields ever since we entered the river, and we might steam for many miles farther on with wheat on both sides all the way. Here it is piled up in great stacks of bags, ready for shipment; there they are threshing by steam; and farther on modern reapers, made in America, are cutting the grain.

Rosario is the chief wheat market of Argentina. It is a large city, built upon high bluffs above the Rio de la Plata, with great warehouses of galvanized iron bordering the edge of the river. Most of the wheat is bagged at the farms, and the cars carry it to the edge of the bluffs, whence it is dropped down into the holds of the vessels

through great iron chutes, bag following bag so fast that they look like a procession of live animals galloping down to the hold.

The wheat crop of Argentina is stored largely in bags. We shall see great piles of bags covered with canvas, as we ride through the fields from station to station. There are little mountains of them at the ports, and, where the wheat is threshed, they are sometimes stacked up on platforms, awaiting the time when they can be carried to the train.

Hauling wheat to the cars.

As we go on, we see men hauling the wheat to the cars. What immense carts! There is one with wheels twice as high as our heads. It has sixteen great bullocks hitched to it, and it creaks and screeches as they drag it over the road. There are eighty bags of wheat in that load, and it weighs more than six tons. By and by elevators and better means of transportation will probably be adopted.

The Argentine Republic is comparatively new as a

wheat-growing country, and its methods of cultivation and marketing are rude and wasteful. The climate is such that the stock can feed out of doors all the year round, stables are not needed, and barns and granaries are not used for storing the crop. The most of the wheat farming is done by Italians who have settled in Argentina and who live in miserable mud huts called ranchos. They raise wheat chiefly, working hard during the planting and harvesting seasons and doing little the rest of the time. They plow with oxen, horses, or mules; every one in the family, boy or girl, who is old enough, going out to help with the crop. The boys ride the plow horses and, at harvest time, help in cutting and threshing the grain.

5. FLOUR

WE have come to Minneapolis to learn how wheat is turned into flour. This is the chief flour-making city of the world. It is situated on the Upper Mississippi River, at the falls of St. Anthony, not far from the wheat lands of the Red River Valley. Walking down to the river, we can see the waters below the falls boiling and seething as they rush onward on their long journey to the Gulf of Mexico; and near them the vast tile tanks for storing grain, and the mammoth mills which are working away, day and night, grinding it into flour. The Mississippi River, at this point, has such a volume that its falls create a power equal to that of many thousand horses all pulling at once, and this water, passing into turbine water

wheels, gives the power that moves the machinery of these mighty mills.

Minneapolis began to make flour for sale only about half a century ago, and it now grinds more than any other city in the world. Some of its mills produce several thousand barrels in one day; it has one which grinds fourteen thousand barrels every twenty-four hours, and five which all together grind more than five million barrels in one year. We shall appreciate what this means

Minneapolis flour mills.

when we know that a barrel of flour is about the average amount consumed by one man in a year in the United States; and that these five mills annually grind enough flour to supply bread for all the people of any one of our states — with the exception of New York, Pennsylvania, and Illinois — and a large amount for export besides.

But Minneapolis, while the largest, is by no means the only milling center of our country. Great quantities of wheat are ground in New York, Milwaukee, St. Louis, Kansas City, Chicago, Toledo, Indianapolis, Superior, and Duluth. There are smaller mills scattered here and there

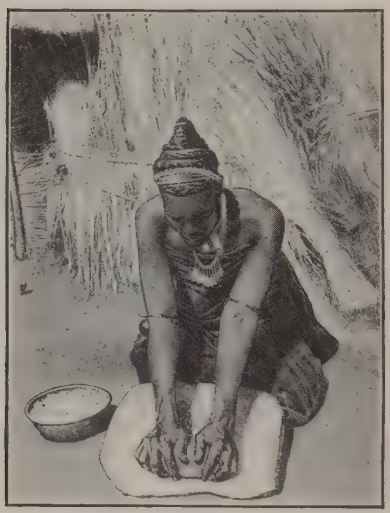
through the various states; so that all together we have more than thirteen thousand mills which are grinding flour. We produce in all much more than a hundred million barrels of flour a year. We grind far more than we can eat; and we ship our surplus to nearly every country of Europe and to many places in Asia, South America, and other parts of the world.

Before going into one of these great Minneapolis mills, let us look at the rude methods by which flour was made in the past, and by which it is ground in some of the less civilized countries to-day. In the beginning man probably ate his grain raw. A little later he found that he could chew it more easily if it were soaked in water or pounded or mashed in a mortar of wood or stone. After a while he discovered that it tasted better cooked, and he began to crush or grind it and make bread and cakes. The first grinding was probably by pounding, or by rolling one stone about upon another, crushing the grain which lay between them.

At first the stones were turned by men or women, later by cattle and oxen, and later still by water. As time went on, the stones were improved; and, for many generations, the most of the grinding of the world was done by millstones with roughened surfaces, one resting upon the other, the grain entering through a hole in the top stone. Such mills are common in Asia to-day. They are largely used in Japan, China, and India, and also in Arabia and in parts of Asia Minor. In northern China the author has seen two women grinding wheat at a rude mill of this fashion, and in the city of Canton he has watched men pushing the top stones round and round by long poles

fastened at right angles to them. In Holland the windmills make the stones go round, and where the Danube River runs through the wheat fields, there are floating mills so anchored that the current moves the great wheels which turn the stones.

Grinding with stones was common all over the world until a little more than a generation ago, and as milling grew more and more profitable, some establishments had so many stones that they produced hundreds of barrels of flour in one day. The flour, however, was not so good as that we now make; and, although the meal was bolted and sifted, and the refuse ground and bolted and sifted again and again, a great deal of the flour was left in the bran and middlings.



Grinding with stones in Africa.

Then separating machines were invented, by which more and more flour was secured. The wheat was mashed to a powder between rolls of porcelain and cold steel and was so treated that all the pure flour in it was saved by this method, and more, cheaper, and better flour was produced than ever before. These inventions created a revolution in milling. They have been adopted in all the flour-making centers of our country; they are used largely in Budapest,

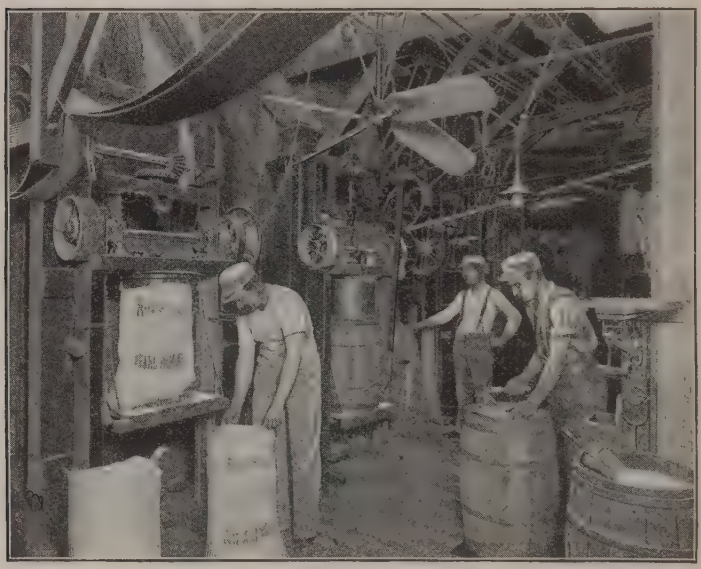
the Hungarian capital, which has so many flour mills that it might be called the Minneapolis of Europe; and also in Canada, Argentina, and, indeed, in most parts of the civilized world.

In order to understand flour making, as it is carried on to-day, we must examine carefully the wheat kernels from which flour comes. They are so small that we can hold hundreds of them in one hand. They are yellow in color and exceedingly hard. Take one and crush it with a stone or bite it in two. The inside is white, and the taste somewhat like starch. Put a few grains into your mouth and chew them. They are soon crushed to a mass which, after chewing, becomes waxlike or sticky. The starch has been swallowed, and the waxy substance that remains is nearly all gluten. Every grain of wheat contains starch and gluten, and these are the valuable parts ground out for flour.

Suppose we slice one of these little grains in half and place it under a microscope. We can now see that it is a mass of white cells with a wall of yellowish cells about them, inclosed in several coats or layers of husks. The inside cells are starch, and those next them are gluten, while the outer layers of husk form the bran. That pear-shaped section at the lower end of the grain is the germ; and it, like the bran, is not good for flour. The flour cells contain the starch and gluten, some of which are also found in the bran. The object of milling is to separate the bran and the germ from the cells of starch and gluten, and to reduce the latter to the soft white flour of which we make bread.

But let us go into that great mill over there and see for

ourselves. We walk through room after room and from story to story. There are but few men about, for everything is done by machinery, and the grain is hardly touched by man from the time it goes in from the elevator until the flour pours out into the well-marked barrels, which are



Interior of flour mill.

rolled upon the cars to start on their journey to different parts of the world.

The first process is cleaning the wheat. It is so treated that the bad kernels are taken out, the dirt and other seeds blown away, and the good grains so rubbed with brushes and washed by strong currents of air that not a particle of dirt is left on them.

The wheat is now ready for grinding, and it goes in con-

veyors to the top of the mill, where it is automatically weighed and started down through the rolls. The first grinding is done between rolls of steel which are slightly corrugated or grooved. Here the grains are broken, and, as they pass on through other rolls, they are ground or mashed finer and finer. After each grinding, the meal is run through a machine which separates the flour and the bran. It is bolted or sifted through silk cloth again and again, and finally it goes through the middlings purifier, which sucks it through a sieve of fine silk, taking out what is left of dust and bran and making the middlings — which, by the old methods of milling, were practically lost — the most valuable part of the flour. Still another milling is required to remove the germ, and, after that, another to make the flour perfect. In all, the wheat passes through six grindings before it is ready to be sold for bread making, and its particles are cleaned and sorted again and again.

In addition to these large mills, we have many smaller ones scattered over the country, some of which grind not only wheat, but also corn, oats, rye, and buckwheat. The grain that is ground by such mills is largely supplied by the farmers of the neighborhood, and much of their grinding is for the purpose of furnishing food for stock. Grist milling, as this is called, is a great industry, although, owing to the better facilities of the large mills, the number of smaller mills is rapidly diminishing from year to year. We have all together about twenty-five thousand flour and grist mills in the United States, and they turn out a product the value of which annually amounts to hundreds of millions of dollars.

6. THE WORLD'S GREAT CORN PATCH

WE have left the wheat fields and are now traveling through the corn belt of the United States. We have ridden through Ohio, Indiana, and Illinois, and, crossing the Mississippi, are going on the railroad north and south through Iowa, Nebraska, Kansas, and Missouri. The corn is just ripening, and the country is covered with tall stalks of green, tinged with yellow, above which golden tassels are swayed by the winds.

Here and there we leave the cars and ride out through the fields. The corn rises high above our heads, and some of the stalks are so tall that when we stand upright in the saddle we cannot reach to their tops. We get down from our horses and walk along the rows. We are in a great thicket of stalks, each of which has wide green leaves growing out from the joints all the way up. Almost every stalk has one or two ears wrapped in light yellow husks, with yellow, red, or green silk at the end. We pluck one and pull off the husks, and a great golden ear, containing hundreds upon hundreds of grains of ripe corn, appears. We rub the grains off with our hands, and have before us the Indian corn, or maize, of commerce.

Now take up one of the grains and bite it in two. Its inside is white and starchlike. When we put it under the microscope, we shall see that it is made up of many little compartments, each filled with cells; and that there are thousands of cells in one grain. Each cell contains starch and other matter good for food. Indeed, corn is considered one of the very best of foods. We eat it ourselves;

and it is consumed to such an extent by cattle and hogs that it forms the basis of our vast packing-house product, enabling us to supply meats not only for ourselves, but to ship large quantities to other nations all over the world.

We have already learned the magnitude of our wheat crop. Our corn crop is much bigger and is even more

Corn districts of the United States.

valuable than our wheat crop. Corn thrives better in the United States than anywhere else. It is grown all over the eastern half of this country, although the largest part of our crop is raised in the states before named. We produce all together more than four fifths of the corn of the world. We often raise more than two thousand million bushels in one year, and the crop in the United States has amounted to as much as twenty-five hundred million bushels.

Two thousand million bushels!

The amount is so enormous that we cannot comprehend it. If we could load it on two-horse wagons, as we did our wheat, putting forty bushels of shelled corn in a wagon, and allowing each wagon and the horses that draw it thirty feet on the roadway, the line of teams to haul our corn would have to be more than twice as long as that required for our wheat. Indeed, the corn would fill the wagons of a continuous train more than two hundred and eighty thousand miles long. Such a train would more than reach around the world eleven times; and, if we could bridge the air and start this train on its way from the globe to the moon, it would cover the two hundred and forty thousand miles which lie between us and the moon, and still leave a train of corn wagons forty thousand miles long upon the earth.

Our corn crop is worth far more to us than is our cotton or our wheat crop; and its value is several times that of all the gold and silver we take out of the earth in one year. It is worth so much that it makes a great difference to every one whether the crop is good or bad. If it could be sold as a whole, at the lowest farm price in a good season, it would bring in one thousand million dollars, or more than enough to give ten dollars a year to every man, woman, and child in our country, or about fifty dollars to every family.

But I hear one boy say, How does that affect me? I live far away from the corn belt, and my people have not sold one bushel of corn in all their lives. Yes, but the money from the corn affects you, nevertheless. It goes into all branches of industry, commerce, and trade. The

farmers who raise corn buy the things produced elsewhere. Some of the corn money finds its way to the mills which make cloth, to the tailors who make clothes, and to the merchants who sell them. The price of at least one bushel of corn is required to buy a shirt, and of twenty bushels to buy any suit of man's clothing. Corn money pays for a large part of everything the farmers use. It is with corn money that many of them purchase their wagons, sleighs, furniture, carpets, books, pianos, bicycles, and watches; little Johnny's first boots, and Mamie's new bonnet.

Some of the corn money goes to the railroads which carry the corn to the market and bring the goods back to the farmers. The foundries which make the steel rails get some of it, as do also the woodsmen who cut the ties for the track, the machinists who build the engines, and the miners who dig the coal which runs them. The same is true of the bookkeepers, the clerks, the teamsters, and others all over the country who are more or less engaged in business and trade; so that it is almost impossible to find a place where this corn money does not go. Corn is also fed so largely to cattle and hogs that the prices of meats rise and fall as the corn crop promises to be good or poor. Indeed, the world of commerce is so ruled that the welfare of any body of men affects that of all the others.

But let us return to the cornfields and examine further this wonderful grain. Indian corn, or maize, as it is sometimes called, is a native of our continent. It was unknown in Europe until America was discovered. Columbus found the Indians eating it, and it was he who took the first grains to Europe. These were planted in Spain, and from

there the grain spread to other parts of that continent, and eventually to Asia, Africa, and Australasia. Corn is now raised in Spain, Italy, southern Russia, and lower portions of the Danube Valley. It grows well in Egypt and on the highlands of South Africa. Some is raised in Argentina, Peru, and Bolivia, and smaller quantities in parts of Asia and Australasia.

North America, however, is the great corn continent. This grain is raised in Mexico and Canada, and, more and better than anywhere else, in the United States. It requires a well-drained rich sandy loam which does not bake when the season is dry. It must have many long hot days and warm nights; in fact, just such a soil and climate as are found in most parts of our country, and, at their best, in the seven states known as the corn belt, through which we have been traveling. Illinois, Iowa, Kansas, Nebraska, Missouri, Indiana, and Ohio, each yield more than one hundred million bushels of corn every year, and all together they produce more than one half the corn of the world.

In a cornfield.

As we ride onward through one big corn patch after another, the farmers tell us how the grain is planted and reaped. The fields are plowed in the spring, and in May the kernels of corn are dropped, either by machinery or hand, in hills or drills three or four feet apart. If the seed is planted in hills, these are so arranged that the crop can be plowed either way. In a few days the grain sprouts and makes its way through the soft mellow soil. At first it looks much like grass, but as the summer advances it grows taller and taller, and its leaves and stalks grow larger. It is plowed several times, and the weeds are kept down. Then one ear grows on the side of each stalk, or two ears, one on either side of the stalk, and at the top the tassel appears.

After a season of about four months the grain ripens and is ready for cutting. On small farms this is done by hand, the men going through the fields with great sword-like knives, called corncutters. They chop down hill after hill, cutting the stalks off near the ground and letting these fall back into their arms until each man has an armful. They then carry the stalks to the shocks and stand them in a framework which is formed by bending some of the uncut hills of stalks and tying them together. They place armful after armful in such places, until at last the whole field is cut, and the corn stands on end in big, round shocks, each of which is tied tight near the top. The slanting sides of the shocks protect the ears somewhat from the rain and the corn soon becomes thoroughly dry.

The shocks are left in the field for some time and are then pulled apart, and the husking begins. This is usually done by hand, the men pulling the husks off the ears, which

they throw in piles on the ground. Sometimes the farmer boys and girls meet together to help each other husk. Such parties are called husking bees. They are great fun, especially when one of the party finds a red ear of corn, which is supposed to give him the right to kiss the sweet-

Harvesting corn in Illinois.

est girl of the party. When the corn is all husked, it is taken in wagons to the granary or to the market for sale. The most of that sold is shelled from the cob. The corn of commerce is always shelled corn. After husking, the stalks are again put up in shocks, or carried to the barn, or stacked up for feed for cattle, sheep, and hogs.

On the larger farms much of the work is done by machinery. The plows are ridden by men, a number of rows being dropped and covered at the same time. The

tilling is by cultivators which will plow several rows at once; and the reaping is with machines which cut many hills and bind them. There are also machines which husk the corn as they cut it; and some which tear the stalks and leaves to shreds, so that the cattle can more easily eat them.

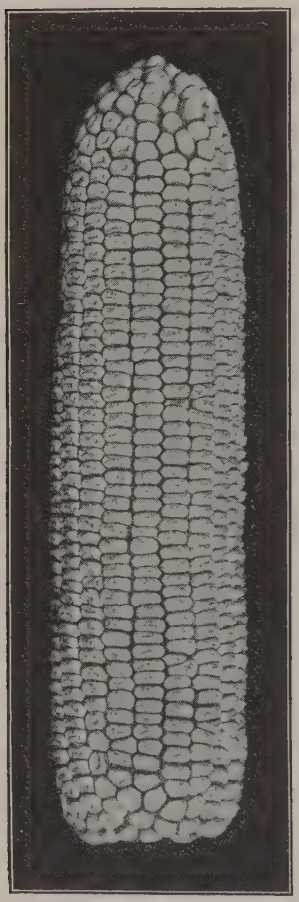
One of the most important things in corn raising is that the right seed be chosen. Our corn lands, on the average,

Cutting corn by machinery.

the United States over, produce but little more than twenty-five bushels per acre, but in some places they produce from fifty to seventy-five, and up to even one hundred, bushels per acre, for very large tracts. The most corn ever produced on one acre was in South Carolina, where the yield was two hundred and thirty-seven bushels.

Now it has been found that if the best seed is used, the crop can be greatly increased; and many believe that if such seed were used all over our country, our enormous

corn crop might be doubled. The people of the corn states realize this, and every farmer tries to have the best seed. He saves the finest ears of his thriftiest plants and grows seed from them. He selects the best of this corn and plants it again, finding that his seed grows better and better year after year, and that by such improvements he can vastly increase his crop.



Good ear of corn.

In the corn states through which we are traveling, the farmers' boys study seed corn; and many of them have little corn patches of their own in which they try to raise better corn than their fellows. In some communities there are seed-corn associations which offer prizes of from three to twenty-five dollars each for the best ears of seed corn. The boys bring their samples to these associations to be judged, and the one who has the best gets the prize. There are thousands of boys in Illinois, Iowa, Missouri, and other states who are raising corn in this way.

As we travel on through the corn belt, we see the important part that corn holds in providing meat for our tables.

Every farmer has a large number of cattle and hogs. He feeds the most of his corn on the farm and sells it as pork or beef, in the shape of fat live stock. A pound of corn as corn is worth only a fraction of a cent. But when it has been turned into beef or pork, it can be sold for several times that much, and at the same time the farm be enriched by the manure of the animals. On this account, the most of the corn crop is fed in the regions where it is raised, the animals grinding it up, as it were, into meat. We pass train load after train load of fat cattle and hogs on our way through the corn states. They have been sold by the farmers and are now being taken to Omaha, St. Louis, Kansas City, Chicago, and other great meat-packing centers.

In fact, we consume the greater part of our corn crop at home. Not one bushel in twenty is shipped abroad. We use corn for many things and especially for food, grinding it into meal for bread, mush, and cakes. We have breakfast foods made of it, and also hominy and cornstarch. The most of our alcohol comes from maize, and the grain forms the basis of whisky, also of cologne and other perfumeries. From it comes glucose, a thick white sirup which is used largely on our tables and for making candies, as well as for adulterating molasses and honey.

Another valuable product of Indian corn is starch. We saw, through the microscope, the starch cells that each kernel contains. There are so many of these cells that corn makes more and better starch than any other cereal; and, for this reason, we have great factories which supply all we need of this article, as well as large quantities of it for shipment abroad.

The process of starch making is interesting. The grains

are placed in great tanks of copper, wood, or iron, each of which will hold a thousand bushels at one time. A mixture of sulphuric acid and boiling water is now let in. This softens the grains, and they are then ground or crushed to a pulp, in order that the germ and other parts may be separated from the starch. They are ground again and again, run through rubber rollers, and the pulp is carried out upon shakers or copper sieves, and afterward upon sieves of fine silk, so that the starch is finally taken up by the water, and the germ and other parts of the grain are freed from it.

The starch is again washed, to make it more pure, and then allowed to settle. It is dried in kilns or furnaces and, after passing through a variety of machines, is ready for use to stiffen our dresses or shirts, to size paper, and for other purposes. Starches intended for cooking must be purer and whiter than those used for clothes washing, and they require special treatment.

Starch is also made from other grains, such as rice; and we have seen that it forms a large part of our wheat. It is also found in the potato, the sweet potato, and cassava. Indeed, the most of the starch of Europe is made from potatoes.

The germs and refuse of the grain used in starch making are carefully saved. They are dried and ground to a fine meal which contains a large percentage of oil. The oil is pressed out and sold for various uses. The cake which remains after the oil has been pressed out is excellent stock food, and a great part of this product is shipped to Europe to feed cattle.

The leaves and stalks of the corn have a great feeding

value. They are usually known as corn fodder and are fed everywhere to horses, cattle, hogs, and sheep. Our crop of corn fodder weighs more than our hay crop by many millions of tons.

Corn husks are used for mattresses. The outer portions of the stalks, ground to a pulp, make a strong writing paper, and the pith is employed in the manufacture of varnish, gun cotton, and other high explosives. The pith is also used in the construction of our war vessels. It is packed between the hull and armor plates of these vessels, to keep them from sinking if they should be pierced by a shell from the enemy. It is so porous and spongy that when the water flows in, it swells rapidly and fills up the hole.

In addition to this field corn, used for grain and meal, we have other varieties of maize which form a large part of our food. Nearly every American garden has its patch of sweet or sugar corn for roasting ears, and perhaps a row or so of popcorn, from which come the hard flinty grains that burst out white as snow when held over the fire. These varieties are grown in the same way as field corn. The sweet corn is eaten, however, when the grains have just formed and their milky juice has not hardened. The husked ears are boiled or roasted, and then eaten or canned for use during other parts of the year. We have built great canning factories to put up such corn. The work in these factories is done by machinery. There are machines for removing the silk, others which will cut the grains from the cobs at the rate of four thousand ears per hour, and still others which will fill twelve thousand cans in a day.

7. RICE

WE must keep our eyes open this morning, for we are on the other side of the globe from America. We have come to Asia to learn about rice, a grain which is eaten by every civilized people, and which takes the place of bread with a large part of the human race. The Chinese like rice better than wheat, and all Oriental peoples esteem it the best of foods. We have seen that America is the chief corn continent because it has just the soil and climate best fitted for that crop. For the same reason Asia might be called the rice continent. Parts of it have just the conditions needed for raising excellent rice, and therefore Asia produces more rice than any other of the great land divisions. Indeed, it raises many times more than all the rest of the world put together.

The Chinese like rice.

The grain thrives in the rich wet soil about the mouths of rivers, in low valleys, and in flooded plains. The southern and eastern portions of Asia are largely made up of hot river bottoms and low-lying plains, cut by streams which furnish ample water to irrigate the crop. These climatic and surface features are especially marked in British and Farther India, and also in the central and

southern portions of China. Rice also grows well in certain mountainous islands of the tropics, where the rainfall is heavy and the streams furnish water for irrigation; in Java, for instance, where the sides of the mountains are terraced for rice; and in Japan, where their lower slopes are spotted with rice fields, the water from above flowing from level to level down to the rice which grows on the plains.

Notwithstanding the fact that Asia raises so large a proportion of the rice crop of the world, the grain grows in almost every warm country. It thrives in the lowlands of our South Atlantic and Gulf States, in swampy parts of southern Europe, and in the delta of the Nile. It is produced in abundance in the Philippines, in Sumatra, Ceylon, Madagascar, and Mauritius, and also in Hawaii and many other islands of the Pacific. It is raised in the West Indies and in the tropical lowlands of Central and South America.

Like wheat, rice is one of the oldest of grains. It is supposed to have originated in India; and it was eaten by the Chinese thousands of years before Christ. It began to be cultivated in Europe, in the marshy lands about Venice, shortly before America was discovered, and it was brought to the United States about two hundred years later. Our first seed rice came from Madagascar. In 1694 a ship from that island, which had been driven out of its way by a storm, landed at Charleston, South Carolina. Its captain had a sack of unhusked rice with him; and, upon leaving, he gave it to Thomas Smith, who was then the governor of the state. The seed was distributed. It was planted in low swampy places, and a large yield of excellent rice was the result. The farmers learned about this

crop. Those who had the right soil began to plant rice, and in a short time it became one of the chief crops of South Carolina and Georgia. Later it was grown in Mississippi, Alabama, Louisiana, and Texas.

Sheaves of Louisiana rice.

Our rice is about the best raised anywhere. It is sweeter, larger, and better colored than that of Asia, and it commands a high price. There are as many varieties of rice as of potatoes or apples. There is a wild rice which grows in southern Asia, an upland rice which requires no irrigation and can be raised in the mountains, and there are many irrigated varieties which produce the rice of commerce. Some rices have small grains, and some large; some are white, and some red; some are scented, and some not. The nations which largely live upon rice know the different kinds, just as we know the best coffees or teas; and each rice commands its own price in the markets.

As we go on with our travels, we shall observe that rice is not a cheap food. It costs so much that in many parts of India, China, Japan, and other countries of Asia the poorest people cannot afford to eat it; and they live upon the seeds of millet, sorghum, rye, and barley instead. We

shall see that more work is required to produce rice than any other cereal; so much that the price of the grain must be high in order to pay for the labor of producing it.

Let us visit some of the rice regions. We start in Japan. The lowlands are a patchwork of fields not bigger than our gardens, each walled with a little embankment about a foot high, upon which grass and wild flowers are growing. Some of these fields are covered with water, and plants that look like grass are growing in them. The sun is now at its brightest. It makes the water sparkle like diamonds, and the green grassy rice plants stand out like sprays of emeralds upon it. Higher up are other patches of green rice, and the hillsides are everywhere terraced, so that the whole looks like an inclined plane of wide irregular steps of mirrors or silvery water spotted with green.

In some of the patches the rice is higher than in others; here the water has been drawn off for the time, and there the dry ground is being prepared for planting. See that field with the quaint little brown men, women, and children working in it. Each wears a hat like a butter bowl; the women have on gowns of blue cotton, and the men and children are half naked. They are digging up the ground with mattocks and smoothing it off for the crop.

Now let us go on up the hill to where that family is planting the sprouts. We may take off our shoes, if we will, and wade in and help. The field has been flooded, and the water comes halfway to our knees. The rice planters are wading; they are bending over, reaching down under the water, and setting the green, grasslike sprouts, raised in the seed beds, deep in the mud.

Rice is grown in the water, and it must be kept flooded the greater part of the time until it matures. This necessitates a system of canals or other means of irrigation. In many places in Japan and China men are always pumping water for the rice fields. They raise it by hand from one level to another in buckets or baskets; they run water wheels with their feet, and they drive animals about, turning wheels to which jars are attached. In the Philippines,

Setting out rice sprouts in Japan.

Java, and in large parts of southern Asia huge ungainly water buffaloes drag the plows and harrows through the mud; and in some places such animals are blindfolded and made to turn wheels which elevate the water from the streams to the fields.

After the rice sprouts are set out, the cultivation has only begun. Water must be let on and off from time to time, the rice be weeded again and again, and when at last

it has turned a bright yellow, it must be gathered, pulled off, and husked before it can be made fit to cook.

Let us suppose ourselves in the Philippine Islands when the rice is ready for harvest. We are in the wide valley north of Manila, on the island of Luzon. It is cut up by rice fields, but here the rice is ripe. Instead of the green young plants we saw in Japan, the fields are of a rich, golden yellow. The grain has been watched for days

Plowing for rice in the Philippines.

by the boys and girls; and some of the fields have scarecrows in them, and others strings stretched across them which can be shaken to frighten the birds.

We stoop over and examine the ripe grain. It is much like barley or rye, and it stands quite as thick on the ground. Each stem has headed out into a number of seeds, tightly inclosed in bright yellow husks.

Over there are some of our little brown cousins reaping.

The party is composed of men and women, each of whom holds a small knife with which the rice stalks are cut one by one. When an armful has been cut it is tied up in a sheaf and laid on the ground. By and by the sheaves will be carried home to the granary, and the rice got out from time to time, as required by the family; or, it may be husked in the fields and shipped to the market.

Filipino rice harvesters.

In the chief rice-raising countries this harvest is an important event. At its beginning the natives often have picnics, and in some places, such as Java, they erect little temples in the fields to the goddess of the harvest. Each temple is about as big as a pigeon house; in it is placed the usual offering, consisting of an egg, some fruit, a bit of sugar cane, and a dish of cooked rice.

But even when the harvest is over, the rice is by no

means ready for food. The paddy, which means the grains with the husks on, has to be removed from the straw. In many countries this is done by drawing the grain over saw-shaped knives, so that the heads are pulled or cut off. The rice must now be husked out before it will be ready for use. The husks are not loose in rice, as in wheat, barley, and oats; they stick as though glued to the grain, and they must be pounded or ground off.

This is done differently in the various parts of the world. The rice used by the natives of many countries for their own food is stored in the sheaf, or paddy, and cleaned as it is needed; while that sold in the markets of the world is more often cleaned and polished by machinery in rice mills, which have been built for this purpose at the chief rice-exporting centers.

The natives of Asia husk rice in all sorts of ways. Here in the Philippines and in Java, as well as in many other places, they pound the husks off in mortars of stone or wood hollowed out for the purpose. They are also flailed off or trodden off by animals and men on threshing floors; and sometimes in mortars, by rude machines worked by water. In most places the chaff is taken out by throwing up the mixture of husks and rice against the wind, so that the refuse is blown away, and the clean rice caught in a basket or allowed to fall to the ground. Indeed, nearly every country has its own way of cleaning this grain.

It is different with the mills which prepare the rice for the markets; they are much the same everywhere. We can see them in Saigon, Cochin China, in Bangkok, Siam, at Bombay and Calcutta in India, and also in Rangoon, the chief exporting place for the rich rice fields of Burma.

Let us suppose that we have sailed up the Bay of Bengal and into the mouth of the Irrawaddy River, to visit one of the rice mills of Rangoon. It is a large building on the banks of the river, where the paddy can be easily landed from the boats and the cleaned rice loaded on the steamers for Europe. The manager, who acts as our guide, is an

Japanese hulling rice in hand mills.

Englishman, but the workmen are brown-skinned Burmese, naked to the waist, and with cloth turbans tied around their heads.

The mill is run by steam, and it is filled with modern machinery. We watch the paddy as it passes through one set of millstones after another, until the husks are torn off and the rice comes out clean. We observe that the stones

are carefully set, that they may not injure the white grains. The husks stick so tightly, however, that the grain is rough when it comes out. It must now be smoothed for the market. Think of polishing grain as one polishes silver or gold! That is what is done with almost all the rice we eat. The grains are thrown by machinery, again and again, upon rollers covered with sheepskin, until each is as bright and clean as a new silver spoon. The rice is now ready for the markets, and it is bagged for shipment. In the older rice-raising countries much rice is eaten unpolished, and it is said that polishing the grain rubs off much of its nutritious and appetizing qualities.

The United States has the finest of milling machinery for threshing, cleaning, and husking rice; and it also has machines for planting and cultivating it. Our fields are irrigated, where it is necessary, by steam pumps, some stationary, and some floating on flat boats or lighters. We use sulky and gang plows to break up the ground, cut-away and disk harrows to smooth it, and machine seeders to put in the grain. We reap our rice with harvesters and thresh and clean it by steam. In this way we are rapidly increasing our rice crop; we already raise almost all we consume, and we may some day ship a great deal to other parts of the world.

In our Asiatic journeys we have had rice served in one way or another at almost every meal. It is usually eaten boiled or steamed and is seldom ground up for flour and made into bread or cakes. It is often served with a highly seasoned curry and, in Japan, with dried fish and a sauce known as *soy*. The Chinese and Japanese make rice beer and rice wines. Chinese boys, on New Year's Day, pop

rice as we pop corn; and we learn that the two grains taste much the same.

Rice is also used to make starch. The inner skin of the husk and the dust from cleaning, as well as the straw, are fed to stock. The husks are often used for packing breakable articles; and in Japan the straw is woven into bags and wrappers which take the place of our goods boxes. From it the everyday hats, shoes, or sandals of the common people are made; it forms the rain shawls, which take the place of our waterproofs, and the shoes for horses and oxen, which are tied on with straw strings.

The rice crop is quite as important to many of the Asiatic countries as our wheat or corn crop is to us. In China a large part of the taxes are paid in this grain, and in Japan the god of good fortune is a jolly little fat man, named Daigoku, seated on bags of rice. As we have passed through the country, we have seen him in almost every store and in the home of every poor man we have visited.

8. OTHER GRAINS WHICH FEED MILLIONS

IN addition to wheat, corn, and rice, several other cereals are raised, which are used as food by many millions of people. In parts of Europe barley and oats are favorite breadstuffs. The poorer classes in Germany, Austria, and Russia use rye flour as the people of the United States use wheat. Rye and barley, when growing, look much like wheat; and oats resemble the other three, save that their grains head out in little branches, instead of in one long head.

All these cereals have long been used by man. Barley was grown in China more than six thousand years ago, and it formed one of the food stuffs of the early Egyptians, Greeks, and Romans. The oat is prehistoric, but rye seems to be of a later origin. Oats were grown by the Romans, though not by the ancient Greeks, nor, as far as we know, by the Egyptians. Caligula, the Roman emperor, is said to have fed his horses on golden oats; but as the grain is yellow, the color alone was probably referred to.

Oats.

Barley, rye, and oats are raised and harvested much like wheat. They are cheaper than wheat; for they will grow upon poorer soils and in a greater variety of climates, thriving in and north of the wheat belt. Barley will grow farther north than almost any other cereal. It is raised in Alaska and Iceland, and also as far south as Algeria and Egypt. The Norwegians use it for bread, and it is also used in brewing beer and as feed for horses in the United States and Europe. If we should become sick during our travels, the doctor might tell the nurses to feed us barley broth. Pearl barley is nourishing and is often used as a thickening for soups.

The world's crop of barley annually amounts to more

than one billion bushels, of which we, in the United States, produce a comparatively small part. Our best barley is grown in California, and we raise more in that state than in any other; Iowa, Minnesota, and Wisconsin coming next in order. In 1904 our barley crop amounted to one hundred and thirty million bushels.

Barley.

If we were attending school in Germany or Russia, and should take our lunches with us, the sandwiches would probably be made of slices of rye bread. The bread would be dark brown in color; were it of the German variety known as pumpernickel, it would be almost black. The common bread of many European countries is made of rye flour. The armies of northern Europe use it, and also the poorer classes of Austria, Germany, Russia, Norway, and Sweden. It is nutritious, and the people like it quite as well as wheat bread.

Rye.

The most of the world's rye crop is grown upon the great sandy plain which crosses Europe from the North Sea into Central Russia, sloping down to the Baltic; and more of it in Russia than anywhere else. The rye crop of the United States is comparatively small. We produce only twenty or thirty million bushels a year; our best rye states being Pennsylvania, Wisconsin, and New York, after which come Nebraska, Michigan, and Minnesota. We use the grain somewhat for bread, but more for stock feeding.

Oats are raised in the United States chiefly as a food for domestic animals, although they are being eaten more and more by man in the shape of oatmeal. In Scotland oatmeal porridge is one of the most common articles of diet, and oat cake and oat crackers are much liked. Oats are excellent for all kinds of stock, and they are used for stock feeding in many parts of the temperate zone.

The world's crop of this grain is enormous. It is greater in amount than that of any other cereal, exceeding wheat

Harvesting oats in the United States.

or corn by several hundred million bushels every year. Our own crop of oats is often more than one third as big as our corn crop, and it is always greater in bulk than our wheat crop. Russia now competes with us as the world's chief oat producer; next come Germany and France. Our best states for oats are Iowa, Illinois, Wisconsin, Minnesota, Indiana, Nebraska, Pennsylvania, New York, and Texas.

All the grains we have so far examined are the seeds of various kinds of grasses. We have one grain from a plant which might be called a sister or cousin of the snake

weed or dock weed. It is of an odd shape, looking more like a miniature beechnut than a wheat or corn kernel. It has a black coat, but is white within, and when ground up, it becomes a grayish white flour, which is used to make griddle cakes. This grain is buckwheat, and the cakes are buckwheat cakes. No doubt most of us have eaten them, served with butter and maple molasses. Buckwheat can be grown on the poorest of soils. It thrives in the temperate zones and is produced chiefly in the United States and in some parts of Europe.

It is wonderful how many seeds are used for food. Every locality seems to have one or more seed grains. Far up in the Andes Mountains near Lake Titicaca, on the high plateau of Bolivia, where oats and wheat will not mature, there is a little plant known as quinua (kēn-wah), the seeds of which form an important food of the Indians of that region. They are not much larger than the head of a pin, but the people make a mush of them and eat it with milk.

As one travels over the world, he finds the natives of distant lands living largely upon grains which we feed only to sheep, horses, cattle, and hogs. This is especially so of the millets, which grow in large quantities in many parts of the world. Indeed, it is said that more of the human race live upon millet than upon any other cereal. East India consumes more millet than all other grains put together. There are vast numbers of poor people in northern China who cannot afford rice, who grind up millet for bread and mush. Millions of bushels of millet are raised in Japan, and in Bokhara, Turkey, and Persia. It is also one of the chief foods in Upper and Lower Egypt, the Sudan, and in parts of South Africa.

The millets belong to the family of grasses, and chiefly to such branches of that family as have smaller seeds than oats, wheat, or barley. One of the most common millets is known as the fox-tail, its long fat bushy head being shaped like the tail of a fox. This kind often grows as tall as rye, or taller. Fox-tail millet is largely used in our country. It is raised in China, having been grown there for more than four thousand years. So many seeds of this millet have been found in the remains of the lake dwellers of Switzerland that we believe it was used as food when those people lived. This was during the Stone Age, a period when man had not yet learned to make metal tools, and cultivated the soil almost exclusively with implements of stone and wood.

Fox-tail millet.

In the United States the barn-yard millets are largely grown for hay, and similar kinds are used in India and in other parts of Asia for food, the seeds being parched or boiled with milk.

In addition to these millets, there are larger kinds which we know by other names. In northern Africa a large seeded millet is called durra and in the West Indies, Guinea corn. Almost all of us see millet straw at home every day, and many of our girls have probably swept with such straw again and again. I refer to the millet of which our brooms are made. This is called

broom corn. It grows as tall as corn, but branches out into many stiff straws at the top. Its seeds are found at the ends of these straws, and from the straws brooms are made. Broom corn will grow on any soil and in any climate in which Indian corn can be successfully produced. Certain varieties have been cultivated for different purposes in India, China, and parts of Africa for some centuries, but the United States, Italy, France, and Germany are the only countries which produce it solely for broom straw.

Sorghum.

Sorghum and Kafir corn are other large millets related to Indian corn. Kafir corn thrives in South Africa, where it has long been cultivated by the Kafirs, from whom it derives its name. It is used as food for both man and beast. Sorghum is grown in Egypt and in many parts of Asia for its seed, which is ground up to make bread. All millet seeds are cheaper than wheat, but they will not make good flour; therefore the civilized nations use them for stock. In our country Kafir corn and sorghum are raised for forage, and sorghum is raised also for the sweet juice of its stalk, which is squeezed out and boiled down into sirup much like sugar cane, as we shall see farther on in our travels.

Kafir corn.

9. ON A WESTERN CATTLE RANCH

WE are up early this morning. The sun is just peeping above the eastern horizon; but the long low wooden building where we have slept over night is already alive with rough-looking men. They are in their shirt sleeves, their trousers are tucked into their high boots, and most of them have cruel spurs on their heels. Each man has a saddle, a bridle, and a long rope in his hand. They are cowboys, and we are with them on one of the great cattle ranches of the far West, making ready for the round-up of to-day.

We have come to this region to see something of our meat industry. By "meat" is meant the flesh of cattle, pigs, and sheep; the word "game" being used for the flesh of wild animals; and "poultry" for that of chickens, geese, ducks, and other domestic fowl. Meat is eaten by man all over the world; and in our country it forms a large part of his daily food. It is much dearer than grain, and nations are often considered rich or poor according to the amount of meat their people can afford to eat. In this respect our nation is one of the richest of all. We raise so much meat that every man, woman, and child of us can have some daily and still leave enough to export a large quantity to Europe and other parts of the world.

Almost every farm in the United States rears some cattle, hogs, and sheep, so that we have a vast number of such animals. Indeed, I should not like to have to count them all. It is enough to know that if the drove could be stretched out in double file, it would belt the globe several

times at the Equator and leave enough animals over to make more than another living, bellowing, bleating, grunting, baaing, belt around the globe, from pole to pole.

Of these animals the most important, as far as the meat is concerned, are the cattle and hogs. The cattle are the most important of all. They are worth about as much as all the rest of our farm animals put together, including not only the hogs, sheep, and goats, but also the horses and mules. We had so many cattle at the time of our last census that if they could have been gathered together in one great drove and divided equally amongst us, there would have been several such animals for every family in the United States. Of this vast drove, the greater part was in the corn regions. Large numbers were on farms in other sections of the country, and millions were grazing on the plains where we now are.

Just east of the Rocky Mountains, running north and south from Canada to Texas, there is a wide strip of land so high and dry that it is not good for farming, except where the few streams give water for irrigation. The moisture is so squeezed from the winds of the Pacific Ocean, as they blow over the cold mountains, that only enough rain is left to produce a thin grass. This comes up in the spring and is cured, as it stands, by the hot sun, as the summer goes on, furnishing a food upon which cattle can live all the year round. In some other parts of our country one or two acres will give enough grass for a cow or an ox. On these high plains the grass is so thin that it often takes fifteen or more acres to feed a single animal, so that the cattle are widely scattered, and but few can feed in one place at a time.

Nevertheless, there is enough grass on these plains to support a great cattle-rearing industry. Men have brought vast herds to the plains, and they live here with their cowboys watching their stock. They usually establish their homes near a stream, having a blacksmith shop, stables, and corrals for ponies, and lodging and eating houses for the cowboys, or rather cowmen, who take care of the cattle. Their food and other supplies are often brought hundreds of miles from the nearest railway station, in canvas-covered wagons, and the cattle, when ready for the market, are driven to the railroad, whence they go east on the cars. It is on such a ranch that we shall suppose ourselves to be at this time.

We step outside the house and look about over the wide dreary plain. The ground is flat, and we can see for miles on each side. The earth is covered with dry dusty grass. Here and there two or three cattle are feeding. Near by we hear the neighing of horses. The sound comes from the corral or yard over there. See, the cowboys are bringing the ponies. There are two hundred of them. They come kicking and jumping. There are enough for the cowboys, as well as one for each of us.

Now we are mounted and are galloping over the plains. The foreman has divided the party and given each man his own work to do. We circle about, driving the cattle, which feed in little groups or singly, here and there, to the center. There are also cowmen from other ranches about the country doing the same, so that by noon thousands of cattle are gathered together.

We eat dinner, supplied by the cook's wagon, sitting flat on the ground, and then take fresh ponies which have been brought from the corral to aid in the round-up.

The purpose of the round-up is to divide the cattle among their owners and to mark every one of the calves with a brand. In this great ranching country there are no fences. The most of the land belongs to the government, and cattle may be grazed anywhere, provided they can have water. The lands along the streams are usually

Cowboys at dinner.

owned by the ranchmen, who, having the water, in this way control large tracts of dry country.

The animals thus run wild; they stray far from their homes and get with other cattle, so that it is only by marking them in some way that a man can keep track of his own. This is done by branding or burning a letter or other mark into the skin of the animal when it is a calf. After that the brand will stay as long as the animal lives. The round-ups are to bring all the cattle together, in order that each man may pick out his own, and every one have

his calves, born since the last round-up, branded with his own mark.

The cowboys are now in the saddle, and the work is beginning. How noisy it is! The bulls are bellowing, the cows lowing, and the calves bleating for their mothers. The cattle are stamping and pushing this way and that. The air is filled with dust made by the stock and the ponies.

A round-up.

The cowboys circle round and round, keeping the great drove together. Now they ride in and pick out their own stock, selecting the animals by the brands upon them. By and by the cattle are separated, and the branding begins.

Some of the crew have built a fire at one side, and in this they are heating long irons red-hot. Men with lassos are getting out the little long-legged calves. They ride about among the cattle chasing the calves. When one darts for the open, a cowboy gallops after him, and, with a sweeping throw, sends his rope in such a way that it catches the

calf around the hind legs. The well-trained pony stops short and braces itself; for the lasso is tied to its saddle. The calf tries to run and is pulled by the rope to the ground. It is now dragged to the fire. One of the branding party grabs it by the ears and sits down on its neck. Another pulls out one of its hind legs, so as to make the

Branded with the brand of its mother.

skin tight; while a third takes the red-hot iron from the fire and quickly presses it upon the live flesh. There is a smoking, hissing, and sizzling, as the iron burns through the hair deep into the skin. From now on the hair will not grow on that spot, and the calf will be marked to the end of its days. The branding takes but a moment, and

the calf is then loosened and runs off to let its mother console it by licking the wound. The ownership of the calf can easily be told from its mother; the cows know their own calves quite as well as our mothers know us, and at the round-up each calf is branded with the brand of its mother. At the same time a record of the act is made in the stock book of the ranch.

We watch them branding other calves in the same way. The work goes on for days, the cattle being carefully guarded at night, until at last all are branded, and each man has his own.

What we have seen is but one feature of the great industry of providing beef for our tables. We might spend weeks on the plains, observing something new every day. We would be interested in selecting the cattle for shipment, in driving them to the stations, and in riding with the stock to Omaha, Kansas City, or Chicago.

Such ranching is largely carried on in Montana, Wyoming, Colorado, Arizona, New Mexico, and Texas. There are also many cattle in the Indian Territory and in parts of Kansas, Nebraska, and the Dakotas. In Texas much of the stock-grazing country is composed of lands belonging to the state, which have been set aside for the support of the public schools. They are leased by the year or ten years to cattle men for only a few cents per acre, but there is so much of this land that it brings in a vast sum.

One of the largest cattle ranches of the world is in Texas. It would take us more than a week to ride on horseback from one end of it to the other; for it is more than two hundred miles long, and ten miles wide, and all together is larger than the whole state of Connecticut. The

company which owns this land obtained it in an odd way. Texas wanted a new state house, and the men who have since made this ranch offered to furnish the money and build it if the state would grant them this land. Their offer was accepted, and the state house was built. Their land has so increased in value that the undertaking has proved to be a very profitable one. They have put wire

On a western ranch.

fences about the ranch and are grazing more than one hundred thousand cattle upon it.

There are many other large ranches throughout the west, where the lands belong to private parties, and not to the state or government. Such ranches are often fenced with wire, and some of them have the top wires of the fence so fixed that they can be used for telephoning from one part of the estate to the other. A big ranch is managed like a great store or factory, a careful account being kept of everything. The cowboys work under foremen, and the cattle are carefully watched from the time they are born until they are ready to be shipped to the markets.

As we ride over the plains, cattle rearing seems an easy business, and we find ourselves wishing we could be ranchmen or even cowboys. We watch the skill with which the men ride their bucking, kicking ponies, and we delight in the races and jollity at the round-ups. If we should stay long, however, we might find that the stockman's life is by no means all fun. He must be out in the snow, watching the cattle to see that they are not lost or do not starve in the storms and blizzards. He often has to ride all day and to sleep out in the open air; and there are sometimes prairie fires, when both cowboys and cattle must run for their lives. To guard against the spread of such fires, wide roads are sometimes made across the prairies or around the ranches.

There is also danger of losing the cattle by diseases and by wolves, panthers, and other wild animals. The little prairie dogs dig holes in the ground, where they live in prairie dog villages with their little dog families. They eat up the pasture; for twenty dogs will consume as much grass as one sheep. They are sometimes killed by the cowboys, who drop poison into the holes. Rattlesnakes make their homes in these holes; and if one of the cattle steps in, it may be bitten by a snake, or may break its leg before it gets out.

Although millions of cattle are reared on these ranches, we must not suppose that they form the chief meat supply of our country. Many more animals are kept on farms than on ranches. The great corn belt raises far more beef than any other part of our country; and the animals reared farther west are often brought to the corn states to be fattened before they are shipped to Omaha, Chicago,

Kansas City, or other meat-packing centers. Some are sent in fast stock express cars to the Atlantic seaboard, whence they are shipped to Europe. They are carefully treated on the cars and steamers. One man has charge of a certain number of animals, and stays with them all the time, to see that they get plenty of water and feed; so that when they land they will be in good condition for sale.

This business is so enormous that cars and ships are built especially for it, and a drove of live beeves is always moving across the Atlantic Ocean from our continent to Europe. The larger part of the drove goes to the United Kingdom of Great Britain and Ireland, which countries, also, as we shall see later, buy a vast deal of fresh beef, killed in America, and sent abroad in cold storage.

Indeed, our meat industry is so important that the greatest of care is taken in rearing fine stock and in transporting it to the places where it is consumed. There are some breeds of cattle which will produce more and better beef than others, and our ranchmen and farmers are always trying to get the best stock.

There are in the world about one hundred different breeds of cattle. Some are large, and some small; some are especially good for meat, and others for the rich milk they produce. In India there are cattle with great humps on their backs, which some of the people worship, and which others use as draft animals and for food. The best of all kinds of modern beef cattle come from England and elsewhere in northern Europe. We have imported many such cattle, and they now form a large part of our stock.

The first cattle brought to America came with Columbus to the West Indies in 1493. Some of their offspring were taken to Mexico, whence they spread northward and became the forefathers of the Texas cattle of to-day. Others were brought by the Spaniards to Florida. Later still a great many fine cattle were brought from England and Holland to Massachusetts, New York, Virginia, and other colonies. From that time until the present we have been improving our cattle by importations from European countries, particularly from England and Holland, these two countries being the homes of some of the best dairy, as well as beef cattle, in the world.

No other country exports so much meat as the United States. In the year ending June 30, 1904, we sold more than one hundred and fifty million dollars' worth of meat to foreign countries, and in addition many live cattle. We then sent three hundred and eighty-seven thousand cattle and almost three hundred million pounds of beef to the United Kingdom, which is our principal customer. The chief other countries which furnish meat to Europe are Australia, New Zealand, Canada, and Argentina; but all of these, except Canada, furnish more mutton than beef, and the Canadian exports largely consist of the bacon for which that country is noted.

There is a considerable shipment of cattle in Europe from one country to another; and in South America they are largely exported from Peru, Chile, Argentina, and southern Brazil. At many of the ports of that grand division the shipping facilities are poor, and the cattle are loaded and unloaded in slings, and sometimes they are raised into the ships by ropes attached to their horns.

10. A VISIT TO A GREAT PACKING CENTER

WE have come from the West to Chicago with a load of fat cattle, to see how they are turned into meat for our tables. Our train had troughs of fresh water fastened to each side of the cars, for drink on the way, and we traveled at a high rate of speed, in order to reach the

Union Stock Yards, Chicago.

market in the shortest possible time. We rode in the caboose, a rough sleeping car at the rear of the train, with the cowboys who fed the stock and looked them over at every stop to see that all were well.

Upon arriving in Chicago we came direct to the Union Stock Yards, in the heart of the city; and here we are now, in the biggest cattle market and the chief meat-packing center of the world. Our beeves are already unloaded,

and they will rest in the feeding pens for twenty-four hours before they are offered for sale.

But let us learn something about meat packing, or the industry which relates to the killing of cattle, hogs, and sheep, and the fitting of their flesh for food or for sale in our markets, or for shipment to other parts of the world. Meat packing is one of the largest businesses of the United States. A vast capital is invested in it, and its product in one year has amounted to almost eight hundred million dollars. It employs thousands of people at the packing centers, and thousands more in our towns and cities to handle the meats. The products are so widely distributed that it requires a vast number of cars and ships to carry them; there is hardly a provision store in our country which does not sell some of them; and there are few of our people who do not consume, in one shape or another, some of the animals, thus killed, every day.

We have already learned how cattle were first brought to this country. Some of those imported by Sir Ralph Lane from the West Indies, in 1610, were considered so valuable for breeding that it was forbidden to slaughter them on pain of death, and others which arrived later were carefully cared for. The stock throve, and as time passed on there were plenty for killing. The farmers raised their own meat, and drovers brought live animals to the towns and cities and sold them to the butchers. As the pioneers moved westward, they took cattle with them, and Ohio, Indiana, and Kentucky soon became stock-raising centers.

At first the meat was eaten only where it was killed. Each town had its slaughter houses, and all fresh meats

were prepared by the local butchers, just as is done in out-of-the-way places all over our country to-day. Then men began to cure pork for shipment to other localities; and, in the middle of the last century, Cincinnati, which at that time was the center of our corn belt, had a large business in killing hogs and sending cured pork by the Ohio and Mississippi Rivers to New Orleans, and around by sea to our Atlantic ports.

As railroads were built, the packing industry increased. Pork was then shipped in every direction, and meat packing extended westward, with the growth of the country, until, at about the time of our Civil War, it had become a great industry in Chicago. Later still, with the development of the corn belt, packing centers sprang up at St. Louis, St. Joseph, Kansas City, and South Omaha. But Chicago, all the while, held its own and steadily increased its business, until now it is the chief pork-packing center of the world.

Long before this, however, the industry had been widened so as to include all sorts of fresh meats. At the beginning the only meat packed was that which could be dried or salted. Beef treated in this way was put into barrels and shipped to our eastern markets, and from them it was sent on ships all over the world. Then it was discovered that if meat were kept in very cold rooms, it not only could be preserved fresh for a long time, but it would be better for eating when taken out, than it was when freshly killed. It was also found that all meat could be better cured if it were properly chilled first. Artificial methods of refrigeration or cooling were then invented, and these inventions form the basis of the great meat-packing industry of

to-day. By them meat can be killed throughout the year and carried fresh in refrigerator cars all over the country. Even in the hottest weather it can be taken to the seaboard and carried in cold rooms across the ocean to Europe. Meat so stored will stay fresh for days, weeks, and months; so that when it reaches the dinner tables of

Cold storage beef in a packing house.

our country or of Europe it is just as good as when it was killed in Chicago. We are now sending several hundred million pounds of fresh beef yearly across the Atlantic; and most of the fresh meats eaten in our own towns and cities come from animals killed some days before in our great packing centers.

Let us take a walk through the stock yards. They are in the heart of Chicago, but we seem to be in a city of

animals rather than of men. The air is filled with the bellowing of steers, the lowing of cows, the bleating of calves, the baaing of sheep, and the shrill squealing of pigs. There are thousands upon thousands of these animals all about us; great droves of them are being taken out of the cars; and tens of thousands are moving this way and that, on their way to be sold or killed.

We climb to the roof of a tall building at one side, and look down. Pens filled with cattle, hogs, and sheep reach far out on all sides. The pens are arranged along streets which cross one another at right angles; and we are told that there are twenty miles of such streets. The city has its own sections and wards, each with its own class of four-footed citizens. There is one section devoted to cattle. It has several hundred beasts in each pen. Farther over is a section of sheep, where thousands of woolly creatures are bleating and baaing; and here at our feet is an army of fat porkers, some contentedly grunting and others squealing like mad.

Notice the pens. Each has a trough for water and another for food. There are miles of such troughs and many miles of drainage and water pipes. The water for the stock comes from artesian wells, driven twelve hundred feet down into the ground, far below the level of Lake Michigan; and the food is the best that can be procured. See the railroad tracks which extend out on each side. There are one hundred and fifty miles of them in and about the stock yards. Those long trains coming in are bringing new animals, while those going out contain refrigerating cars, carrying the meats and other packed products to all parts of the country.

These buildings in the center, which rise high over the pens, are where the rulers of this city live. They form the exchange where the stockmen and packers come together to buy and sell the four-footed citizens. These men handle tens of millions of hogs, cattle, and sheep every year. The animals in the pens are changed daily. Those we see now will be dead by this time to-morrow, and another horde will have taken their places. Those hogs

Cattle being driven to the pens.

down in the street are on their way to be slaughtered, and the wild-eyed oxen which are surging this way and that, just below us, will all be killed before nightfall.

The chief selling time is in the morning. Then the streets are filled with cattle, hogs, and sheep, being driven by men from one place to another. Some of the drovers are on horseback and some on foot. How they yell at the beasts and crack their great whips! The agents of the

big packing houses are moving about, looking over the stock. They buy at a glance; and the sellers jot down the purchases in their notebooks and are paid later on. After the selling hours are over, the animals are weighed, and then taken off to the great meat factories or to other pens to await their time to be slaughtered.

We go down and walk about the stock yards and then enter one of the packing houses near by, following some beeves about to be killed. The animals are driven up an inclined roadway to the upper stories, so that gravity may be used in handling the product, and the meat be ready for shipment when it again reaches the ground.

We go ahead to where the killing is done. As the cattle come up, they are inclosed in a pen, about which, on a platform, a bare-armed man walks, holding a long-handled hammer. Only a few animals are let in at a time, and the pen is so small they are jammed close together. The man strikes them on the head one by one a single blow with the hammer, killing them instantly. As the cattle in the pen fall down, the floor drops a little, and they roll out on to the cement pavement below; and the floor goes back, for the slaughter of others.

Each of the dead animals is now hooked by the hind leg to a pulley and raised, head downward, to a wheel, which runs on a track overhead to the other departments of the factory. As it goes on past man after man, each does something to help fit the carcass for beef. One butcher cuts the throat to let out the blood, which must be saved to make fertilizer; others clean the carcass; and others take off the skin, hoofs, and horns, all of which are saved for

oil, glue, leather, or some other useful thing,— not an ounce of the animal goes to waste.

When the carcass is ready for beef, it is divided along the backbone, making two sides, in which shape it is sold. It is now not more than twenty minutes since the steer was killed, but it has already passed through the hands of

Canning beef.

about twenty men. The meat has yet to go through many other processes before it will be ready for eating. If it is to be canned, it travels to the departments where it is trimmed, cooked, and sealed up in tin cans, each of which has a bright-colored wrapper pasted upon it.

If the beef is to be sold fresh, it first slides along on over-

head trolley tracks into a great refrigerating chamber, so large that it will hold ten thousand sides of beef at one time, and so cold that the temperature is just above freezing. There it remains forty-eight hours, and becomes chilled through and firm to the touch. It next travels on a track down to the ground floor, where it is cut into quarters and loaded into cold storage cars, which will take it to the butchers of Boston, New York, or other cities or towns. The meat is hung upon hooks from the ceiling of the cars, and the cars, when loaded, are shut tight and not opened until they reach their destination.

If the meat is to be shipped across the Atlantic, it is transferred at the ports to which it is sent by rail to the cold storage chambers in the holds of the steamers. From seven to twelve days are required to carry it over the ocean; and it is sold as fresh meat in Europe about three weeks after it leaves Chicago.

II. HOGS AND PORK PACKING

AS we passed through the corn belt, we saw something of the hog industry of the United States. About one third of our corn crop is used to make pork, and although hogs are raised everywhere, the corn belt produces more pork than any other part of our country. In 1900, when a census, or count, of all our animals was made, it was estimated that the United States had more than sixty-two million hogs. If they had been equally divided, there would have been about four hogs to every family, including a sucking pig for each of the babies.

These pigs are of such enormous value that if all the gold that is taken out of the earth in any one year could be coined, it would not be enough to pay for the pork products we make in that year. We raise more hogs than any other country. Germany and Austria-Hungary come next, but our product is greater than that of both those countries combined. We raise all the pork we

One third of our corn crop is used to make pork.

need for ourselves and supply a vast quantity to other nations in different parts of the world. In 1905 we exported more than a billion pounds of pork and other hog products, and received, therefor, more than one hundred million dollars in money. We ship a great deal to England, France, Holland, Germany, and other parts of Europe; we send some to Africa, and also to Australia, Asia, the West Indies, and South America. Our pork is eaten in Alaska and in the Philippine Islands; and there is

scarcely a great steamship which crosses the ocean that has not some of it on board.

Pork is raised, however, by nearly all nations. The hog seems to be a native of most parts of Europe and Asia. He came to this continent with our forefathers, and has grown as rapidly in number as have his human owners. He is now found throughout North and South America. In Canada he eats field peas; in Cuba and in other islands of the West Indies he thrives on palm nuts; in the Philippines, Samoa, and Guam on cocoanut meats; and in parts of the Chinese Empire on sweet potatoes and chestnuts.

In no other place, however, is pork packed in such vast quantities as in Chicago. This city does such a big business in hogs that it is sometimes called Porkopolis, or the city of pork. A larger proportion of the meat packing about the Union Stock Yards, where we have been inspecting cattle and beef, is devoted to hogs and pork products, and the very establishment in which we saw the cattle killed also slaughters hundreds of hogs every hour.

The managers tell us that pork packing is quite as interesting as beef packing, and we ask to be shown through this branch of the factory. We first go to where the hogs are brought in fresh from the cars, on their way to be slaughtered. They have not rested twenty-four hours to cool off, as the cattle had, before being slaughtered, and they look hot and tired. Some are so fat that they cannot move fast, and all are grunting and squealing as the drovers force them this way and that. The first process is cooling them off. This is done by sprinkling them with ice water, giving each a cold bath before killing.

After this, the hogs move onward to a great solid wheel which stands upright with chains fastened here and there on the rim. As each hog comes in, a chain is attached to one of his hind legs, and, as the wheel revolves, he is slowly raised, kicking and squealing, from the ground. The hogs follow each other closely; so that there is a continuous

Pork packing in Chicago.

line of squealing porkers always moving from the floor to the ceiling. As each hog nears the top, he is automatically taken off the wheel, and hung, head downward, on a hook which slides on a sloping rail. This takes him on to the butcher, who cuts his throat. A little later the carcass is dropped into a tank of steaming hot water, and then dragged up to a tower, where the bristles are

scraped off by machinery, and the pork comes out pink and white.

The carcass is now raised to a hook, and, like the beef, is carried on an overhead track to be dressed and cut up for the market. It has to move rapidly, for there are hundreds of other carcasses behind it, and thousands must pass over this track in the course of a day. As it goes by the workmen, each does his part; one cuts it in halves, one trims off a bit here, another a bit there; and within twelve minutes it passes into the refrigerating room, where it hangs for two days.

After this the pork, now cold and stiff, is taken out and started on another journey on the trolley rail. It goes to the chopping block, where the sides are cut into halves, the hams going one way, and the shoulders another.

If we follow these halves, we shall find that the work of cutting has only begun. The pieces are divided again and again. Such of the meat as is to be eaten fresh goes into the refrigerating cars, and is shipped to the markets all over the country. That which is to be cured — and this is usually nine tenths of the hog — is cut into different shapes. The hams, shoulders, bacon, and some other cuts are salted or put in pickle to be cured. They often remain there for several weeks, after which they are taken out and smoked in great ovens, where thousands of hams, tongues, dried beef, and bacon are cured at one time. After smoking, the hams and bacon are put up in canvas, for shipment to the markets.

The other parts of the hog are treated by various methods, each part being prepared for some kind of food. Sausage is made of the trimmings from the hams and the cuts

from the butchers' benches and the killing rooms; the meat being chopped, mixed, and stuffed by machinery. Spices, pepper, salt, and ginger are put in, and sometimes a little potato flour and water. The sausage meat is forced into the skins of the intestines of the hog by great machines, which work so rapidly that they fill about a mile of skins in one minute. The sausages are delivered upon a table, at which stand several men who tie them in links. They are then ready for sale.

The fat of the hog also forms an important article of commerce. It is known as lard. We ship large quantities of it abroad. It is taken chiefly from the parts of the hog not used for food, the fat being rendered out. In 1904 we exported almost three hundred million pounds of lard to the United Kingdom alone.

In meat packing every part of the animal is saved for some purpose. The workmen tell us they can use all of the ox but its kick, and every bit of the pig but its squeal. The blood of the animals is used to make fertilizer, albumen, and stock feed, and also for sizing paper and for refining sugar. The hides are turned into leather of various kinds, and the hair into camel's-hair pencils and shoddy, a sort of cloth. The hip bones, horns, and shoulder blades are made into hairpins, combs, and buttons; the thigh bones into handles for toothbrushes and knives; while the skulls, jawbones, and teeth are sold to bone burners. Hoofs, and scraps of hides, bones, and horns are made into glue; while the tails give hair for cushions and mattresses. The bristles of the hog are used for brushes of various kinds; and from the lining of its stomach comes pepsin, which the doctors give us to aid our digestion.

From the fats, soaps of all kinds are made, as well as oleomargarine, which takes the place of butter. Some parts of the beef are canned in the form of soup, and from other parts are made the liquid beef extracts which are given to invalids.

Even the dirt and refuse are sold as fertilizers, and from other waste is made cyanide of potassium, a chemical of great value in gold mining. Indeed, the by-products of modern meat packing are of such importance that every large factory has a scientific workshop connected with it, where skilled chemists are always experimenting, trying to discover new uses for parts of the animals which once went to waste.

12. MUTTON

WE have left the United States and are traveling far south of the Equator, in the southern part of New Zealand. We have come here to learn about raising mutton for the markets of Great Britain and Ireland. New Zealand is on the other side of the world from Great Britain, and it is so far south of the Equator that, by way of the Strait of Magellan, it is twelve thousand miles or more from the markets of England. Nevertheless, the modern arrangements for shipping are such that sheep in a frozen state can be carried from New Zealand to England, and sold there at a lower price than those raised by the British at home. In this way New Zealand mutton comes into direct competition with our enormous meat exports to the United Kingdom; and as Great Britain is our

best customer, we are anxious to learn how the business of preparing the mutton of New Zealand for the market is carried on.

But first, let us glance at the sheep industry of our own country. We raise many million sheep, both for wool and mutton ; and although we have no mutton for export, we have enough sheep and lambs to supply our own markets. Many are slaughtered at Chicago and at the other great

A New Zealand mutton factory.

packing centers, and fresh mutton, like beef and pork, is sent to different parts of our country in cold storage cars. Sheep are also killed by the local butchers throughout the United States, so that mutton is found in every market house, and it forms one of the chief meats on our tables.

Sheep were among the first animals domesticated by man, and they have been raised for ages in nearly all parts of Europe and Asia. Columbus brought some with him to the West Indies on his second voyage, in 1493 ; and later others were imported from Spain to Mexico and

Florida. The Mexican sheep grew rapidly and spread northward to our country. There were soon great flocks of them in New Mexico, and later the priests of the Mission Stations in California began to breed them. Indeed, it is said that these missions, in 1825, had more than one million sheep of their own. As early as 1609, sheep were brought from England into Virginia, but the wolves which then infested that region killed so many of them that they increased but slowly. Still later some were imported from

Sheep on a western ranch.

Holland into New York, and from Great Britain and Spain into New England; these thrived and in time spread throughout the colonies and were taken westward, as the country was settled.

At present the most of our sheep are reared in the west. Many are to be found in the corn and wheat regions, and they are pastured in great flocks on the high dry lands of the Rocky Mountain plateau. At the last census, we had all together about sixty-two million sheep. The three states having the greatest number were Mon-

tana, Wyoming, and New Mexico, each of which had five or six millions; next came Ohio, which had more than four millions, chiefly in small flocks scattered over the farms. Utah followed with about four millions; and then Idaho and Oregon with three millions each.

On the high lands of our western plateau sheep are pastured out of doors all the year round. Like the cattle we saw on the great ranges farther west, they live on the thin grass which has been cured by the sun as it stands. They are herded by shepherds, who live in wagons, with their flocks, far out on the plains. One man and his dogs can guard two or three thousand sheep and keep them from straying. From time to time, some of the flock are shipped east to the markets, or to the corn belt to be fattened, and thence on to the packing houses. The meat is treated much like that of the cattle and hogs we have already inspected.

Sheep are now reared in most European countries and especially in southern Russia, Spain, and the mountainous lands along the Mediterranean Sea. They graze in northern Africa as far south as the borders of the Sahara; and since southern Africa has been settled by Europeans, a large sheep-growing industry has sprung up there. In the wilds of The Sudan are sheep which grow hair instead of wool; and in Abyssinia and northern China and Mongolia are some with great tails so loaded with fat that they drag on the ground. Sheep thrive on most of the highlands of Asia. They are found in vast numbers in Argentina, Australia, and New Zealand, and also in the Falklands, far south of the Equator. The principal sheep-raising countries are Australia and Argentina, after which come

the United States and New Zealand. Australia, however, raises its sheep chiefly for wool, while in Argentina and New Zealand the mutton is also an important product.

Sheep in Australia.

In New Zealand both food and climate are just right for producing fine mutton. The weather is mild all the year round; there is plenty of rain, and the rich grasses keep the sheep fat. The country is one of high mountains, many hills, and deep valleys; there is good water everywhere; and turnips, on which the sheep thrive, can be easily grown. We see the woolly flocks feeding as we ride over the islands. They are kept inside fences and are not herded as are our sheep of the Rocky Mountain pla-

teau. The farmers live in comfortable homes near their flocks, and the farming scenes are much like those of our Middle States.

But stop, where are the barns and the haystacks? We see none as we look over the landscape. They are not required here. In New Zealand the climate is so mild that the grass keeps green all the year round, and there is little need of putting up hay where the sheep and cattle can always feed out of doors.

See that flock of sheep eating turnips. The field is green, for they have just been let in, and they are munching the tops. By and by all the green will have disappeared, and the black ground, with the bare turnips upon it, will look as though it had been sown with new baseballs. The sheep will next eat these, biting away at each turnip, until they have eaten every bit of the root. Some of the farmers dig up the turnips and store them in pits or mounds, and feed them to the sheep as they are needed.

Now let us visit the factories and see how this far-away mutton is prepared for the tables of London. We choose one at Christchurch, where five thousand sheep are killed every day. It seems rather small after the great packing houses of Chicago, but this is only one of many in the country; the frozen meat annually shipped selling for millions of dollars.

We take a carriage at the hotel in Christchurch and ride out to the factory. The buildings are great sheds, surrounded by paddocks filled with sheep ready for killing. Behind them are drying yards, which, at first sight, seem covered with snow, but are really spotted with great

piles of newly washed wool. This wool has been pulled from the skins of the animals killed for mutton.

We are first taken to the stock yards, where men are driving the fat sheep up a passageway to the killing department on the second floor. See how quickly they go. Sheep instinctively follow a leader; and here the leaders, known as decoys, are trained to conduct their fellows to slaughter. Day after day, year in and year out, those old sheep at the head lead the flocks up that passage, stepping out at the top to go back to lead other flocks to death.

We follow the sheep into the building, and go with them into the killing room. We are now in a great hall, lined with pens, each of which holds twenty sheep. The pens face a central aisle, where stand the butchers. The sheep die at the rate of ten every minute.

After killing a sheep, the butcher hangs it upon a hook behind him and strips off the skin. He cuts off the head and washes the body down with hot water. This is done so quickly that in less than seven minutes the sheep is killed, dressed, and ready for freezing. It is now hooked to a pulley, and started by means of a shove; and the pulley, which runs by gravity on little steel tracks, carries the carcass off to the cooling room. From now on it will scarcely be handled by man until it is ready for shipment to Europe.

We go into the rooms where the carcasses are cooled for forty-eight hours, before they take another trip on pulleys into the cold chamber, where they are frozen, preparatory to their long voyage over the ocean. In this place everything is ice cold, and Jack Frost is king. The ceiling and

the sides of the room have great coils of pipe covered with frost; and we are told that the pipes contain brine kept intensely cold by passing through a refrigerating machine; it reduces the temperature of the room to only a few degrees above zero. The place is full of frozen meat now. The pink and white mutton hangs down from the ceiling in rows of headless sheep, so close to one another they almost touch.

Slide into the cold storage chamber of a steamer.

There are one thousand carcasses in this room, all frozen stiff. We tap one of them, and the sound is like that made by tapping a drum-head. We take it down and rest it on the floor. It is as hard as stone and so stiff that the meat does not bend. It chills our fingers, and we are glad to see it back on the hook.

We next go into the rooms where the frozen mutton is stored. These are of the same character as the freezing

chamber, save that they are filled with sheep carcasses, each inclosed in a bag of white cotton, and these are stacked up like cords of wood. They are now ready for shipping, and will be taken from here and loaded upon the cars which will carry them to the harbor. There they will be thrown out into trough-like chutes, down which they will slide into the cold storage chamber of a great ocean steamer, not to come out until they are landed in London.

Many establishments similar to this are to be found in the Argentine Republic, a country which also sends much frozen mutton to England. The chief factories of Argentina are at the great seaport of Buenos Ayres, and the mutton goes almost directly from the factories into the holds of the steamers. The distance from Buenos Ayres to London is only a little more than half as great as that from New Zealand, but nevertheless, New Zealand exports a larger amount of mutton. In both countries beef also is frozen for the English markets, but Argentina far exceeds New Zealand in shipping frozen beef, although its export of fresh beef to the United Kingdom is far less than ours.

In the mutton freezing factories the waste is as carefully saved as in our packing houses. The wool is taken from the skins and used to make clothing, and the skins are dried and shipped in bales to the leather markets. The hoofs are used for gelatin and glue, the big bones make knife handles, buttons, and combs, and of the entrails fiddle strings are made. The bones are ground up to feed chickens, and both blood and bones are used as fertilizers.

13. MILK, BUTTER, AND CHEESE

MILK is one of the world's best foods. It is used everywhere, and many different kinds of animals are reared to supply it. In the far northern parts of Europe, along the Arctic Ocean, the Laplanders get milk from the reindeer, and freeze it in blocks to be kept until needed; in the Deserts of Sahara and Arabia the natives drink the milk of camels and asses; and in western Asia there are wandering Tartar tribes who live largely on mare's milk. In some European countries the goat is the poor man's cow, and on the little island of Malta, in the Mediterranean Sea, thirty thousand goats are kept for their milk. Switzerland, Germany, Austria, and Norway, as well as France, Italy, and Spain, consume goat's milk by the millions of gallons. Some of the people drink it in their coffee, some use it to make butter, and some manufacture it into cheese for shipment all over the world.

Sometimes the milk is delivered direct from the goat, the animal being driven through the streets from house to house, the purchasers watching the goatherd and making him turn his can upside down before he begins, to make sure that there is no water in it. A good milch goat will yield a quart or more at one milking, and it can be milked three times a day.

But it is not from goats, sheep, camels, or reindeer that the most of the world's milk supply comes. It is from cows, which are kept for this purpose all over the world. We have seen how cattle are reared for meat. We also keep many for butter and cheese. Such animals are known

as dairy cattle, and the United States has more of them than any other country on earth. If everybody in this country drank milk, there would be enough to give each of us at least one glass every day. At the time of our last census, we had about eighteen million dairy cows; and our product of milk, butter, and cheese was so great that dairying was one of the most important of all our industries.

Jersey cow.

A good dairy cow is one which turns the most of its food into milk rather than into beef. It should produce at least six quarts of milk every day for three hundred days of the year, or about four thousand pounds of milk in that time. Many of our best dairy herds annually yield more than five thousand pounds of milk for each cow, and there are some cows which give every year ten times their own weight in rich milk. Brown Bessie, the champion Jersey butter cow of the Chicago World's Fair, produced, in ninety days, thirty-six hundred and thirty-four pounds of milk.

When we visit the dairies, we shall learn that the quality of the milk is quite as important as the quantity. The Jersey cow, for instance, gives a comparatively small amount of milk, but this is so rich that it makes more butter than any other kind. Some fine Jerseys yield twenty-five or thirty pounds of butter a week, and a single cow has produced as much as one thousand pounds in one year. The Guernseys, which, like the Jerseys, originated on one of the islands of

Red Polled cow.

the English Channel, have rich milk ; and so have the Ayrshires, which came from Scotland; and the Red Polls and Shorthorns, which are bred also for meat. Holstein cows are large black-and-white cattle, which originally came from Holland. They yield so much milk that it is not uncommon for a cow to give her own weight in milk in one month, but the milk is not so rich as that of the other breeds above mentioned.

Indeed, milk is chiefly valued according to the amount of cream or butter fat it contains. We can understand this by examining a drop or so under the microscope. As we pour the milk out, it looks like a white liquid, and one might suppose it to be wholly liquid, without solid particles. Under the microscope, however, we see that it is a clear, transparent fluid with many minute globules, or little bodies of fat of various sizes, swimming about. This fluid

Holstein cow.

is composed of water and the parts of the milk which, although solids when dry, are now dissolved in the water, just as though they were sugar or salt. The globules cannot be so dissolved. They are balls of pure fat, so small that a single drop of milk contains millions of them. Indeed, it is said that if a person tried to count all the bodies in one drop of milk, and should count at the rate of one hundred per minute, ten hours every day, and six days every week, it would take him ten years before he got

through. The globules average about one ten-thousandth of an inch in diameter, and it would take many of them, placed one on top of another, to equal the thickness of this page we are reading.

We next take some milk from which the cream has been skimmed, and magnify it. Most of the fat globules have disappeared, and we see one here and there. Now put the cream under the microscope. It seems to be made up of such globules. The little fat bodies are as close together as peas in a bag, and they look like yellow shot piled one upon another. Milk is rich or poor according to the number and size of these minute bodies of fat, and that of our best dairy herds has the most and the largest.

If we should keep the drop of milk long under the microscope, we should see that the fat drops gradually come to the top. The milk serum, as the fluid itself outside the fat is called, is heavier than these globules, and therefore it sinks. It is altogether a matter of gravity. The heavier milk particles go to the bottom, the light fat ones rise to the top. It is the lightness of the fat particles that causes them to ascend and fill the upper part of the milk, making cream.

Upon this same principle all kinds of milk buying and butter making depend. The milk serum is not pure water. It contains sugar and casein, as well as a little albumen and some mineral matter, all of which have a food value, as we shall see later on. It is, in fact, more like a sticky sirup than water, and the fat particles cannot make their way rapidly through it. For this reason the cream comes up slowly.

If milk or cream is beaten or churned vigorously for a time varying according to the temperature, the age of the

cream, and the speed of the churn, the fat globules unite, forming butter, and separate from the watery serum or buttermilk. This sinks to the bottom and is allowed to drain off; the butter is then worked, and washed in cold water till all the buttermilk is removed.

Until recently, cream was gathered from milk by allowing it to stand in crocks or pans in a cellar to cool, or in the running water of a spring house. After twelve or more hours most of the yellow butter fat had come to the top and could be skimmed off and churned. Our first dairy factories bought the milk and gathered the cream in this way. Later, the farmers, having skimmed their milk at home, carried the cream to the factories. Then a machine, called a separator, was invented, by which the butter fat could be taken quickly out of the milk; and it is by means of such separators that cream is now gathered in our chief dairy districts.

Indeed, it is said that there are more than one million separators in use in our country to-day. They are of all sizes and patterns. In the great dairy factories and on large farms they are moved by water, steam, or electricity; and in smaller establishments by horses, oxen, and even by dogs, sheep, and goats. Some of the larger machines will take the cream from as much as five hundred gallons of milk in an hour, or from more than eight gallons in one minute. The separator is a whirling machine and skims the milk by centrifugal force. The milk is put into a great steel bowl, held in an iron frame, and whirled round at the rate of from fifteen hundred to twenty-five thousand revolutions a minute. It moves so rapidly that one cannot see that the bowl is going at all; so rapidly that the milk serum

which, as we have seen, is heavier than the fat, flies out to the walls of the bowl, and at the same time the cream comes to the center. The cream flows out through one pipe, and the skimmed milk through another. In some of the large dairy factories and creameries such separators are kept going steadily, the fresh milk pouring in from a great reservoir, and the cream and skimmed milk flowing out.

Many of these establishments take the milk from the farmers, run it through their separators, and pay for the cream, the skimmed milk being given back to be carried home for the hogs. In other places the fresh milk is bought outright, and paid for according to its butter fat. The quality is gauged by different instruments, one of the most common being the Babcock milk test. This is a little bottle with a long, slender neck, marked in a very similar way to the thermometer that doctors use for taking one's temperature. A tablespoonful of milk is put into the bottle, together with a little sulphuric acid. The bottle is laid on its side and placed in a machine which whirls it around, throwing the butter fat to the neck; so that, by reading the figures to which the fat rises, one can tell just what percentage of fat there is in the milk.

But it is not alone the fat in the milk that we use for food. The milk serum, or pure skimmed milk contains sugar and casein, as well as albumen and some valuable salts. The sugar is sometimes extracted and reduced to a solid. It then looks and tastes like powdered white sugar, although not so sweet. You may find it for sale in almost any drug store. It is from the casein that we make curds for cheese; and the salts are chiefly soda, potash, phosphates, and lime. In one hundred pounds of good

milk there are about eighty-seven pounds of water, four pounds of fat, three and one third pounds of casein and albumen, and seven tenths of a pound of salts.

Milk forms so large a part of our food that we ought to know just what it contains, and also whether we are getting pure milk and rich milk when we buy it. You may have heard of the bad boy who told the farmer that his best cow had an apple fast in its throat; and how when the man ran out he found that his pump spout was choked up in that way. Milk peddlers are frequently accused of watering their wares. Even in those countries where the cows are driven from door to door, the man who peddles the milk sometimes has, it is alleged, a rubber bag of water under his coat, with a tube running down the sleeve to his hand, so that when he presses his arm against his side, the water flows in and mixes with the milk as he draws it from the cow. We believe most of our milkmen are honest, and that what they sell will stand the milk test. Good milk should have a yellowish white color and taste sweet and pure. If allowed to stand for some hours, the cream should rise to one eighth or one fifth of the volume of the milk, and when the cream and milk are poured out there should be no sediment, although the milk may cling a little to the vessel. Skimmed milk or poor milk is thinner than whole milk, and is of a bluish white color.

Let us examine the different branches of our great dairy industry. We have produced in one year about seven billion gallons of milk, of which about two billions were sold as milk, and one hundred and fourteen millions as cream. Three billion gallons of milk were made into butter, twenty-one million gallons were turned into cheese,

and from a large quantity condensed milk was manufactured. We made so much butter that year that if it could have been properly distributed, it would have spread at least one loaf of bread for every man, woman, and child in the whole world. Our product of butter was fourteen hundred and ninety-two million pounds. We made

Milking on a model dairy farm in New Jersey.

almost three hundred million pounds of cheese, and our dairy products all together were worth about six hundred million dollars.

This vast industry is carried on in all parts of the United States, but mostly in our Central States, north and south. That region supports nearly two thirds of our dairy cows, the North Atlantic States coming next, with about

one sixth of the total number. The chief butter states are Iowa, New York, Pennsylvania, Illinois, and Wisconsin. New York and Wisconsin yield two thirds of our cheese.

The most of our butter is made on the farms, but enormous quantities are produced in factories, where everything is done by machinery moved by steam or electricity. In factory churning, a hogshead or more of cream is turned into butter at a time; the butter is worked by machinery, and is packed in prints, bricks, rolls, or in buckets or casks, for the different markets.

Making butter by machinery.

Another important branch of this industry is cheese making. Cheese is composed of the casein and fat, most of the other constituents of the milk passing off in the water or whey. Cheese is rich or poor according to the amount of fat it contains. In cheese making the milk is curdled by putting into it a piece of a calf's stomach, called rennet. This makes the milk coagulate, or turn into curds. The whey or water is now pressed out, leaving a solid mass, which is cured and

ripened into the different kinds of cheese. Whey is used for making milk sugar and for stock feeding. Some years ago most of our cheese was manufactured on the farms; now all but a small part of it is made in the many factories which have been established in our chief dairy states.

We also have establishments for making the condensed milk which we produce for our home market and for ex-

After the arrival of the milk train.

port. From such milk a large part of the water has been evaporated, so that this milk can be kept in cans for a long time. It is used by babies, and also by sick people, and on ships and in other places where new milk cannot be obtained.

The business of selling fresh milk and cream to the people of our towns is enormous. Each great city consumes a little ocean of milk every week; and this must be

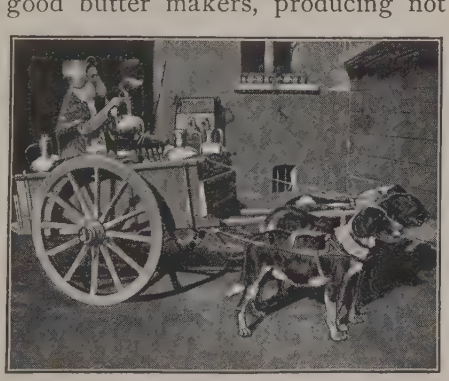
brought daily from the farms and dairies and distributed from house to house. This milk comes to the cities on the cars, often traveling two or three hundred miles before it reaches the consumer. Every railroad entering New York or Chicago has special milk trains, in some of which are refrigerator cars. Many of these trains arrive in the city at midnight, and the milk is kept ice cold until it can be loaded upon the wagons the next morning. It is shipped in heavy cans holding from five to ten gallons each. It is then put into bottles holding a quart or a pint each for delivery. In the dairy regions many of the towns are served by farmers who have milk routes and deliver from door to door.

14. DAIRYING IN OTHER LANDS

WE have left the United States and are traveling through the chief dairy countries of Europe. None has as many cows as our country has, but in many of them more butter and cheese for export are made. Our vast product is mostly consumed at home, although we sell some of it in Great Britain and elsewhere. One of the chief butter-exporting countries of the world is Denmark. It is a low flat land cut up by the sea, not more than twice as big as New Jersey; but it has excellent pastures, and it rears a number of fat dairy cows. It is, moreover, so near England that it can send its butter there cheaply; and so much of its butter is shipped to the English market that Denmark is sometimes called London's chief dairy farm.

The Danes are thrifty and intelligent people, and they realize that if one would do a good business from year to year, he must always furnish the best goods of his kind. For this reason the Danish government takes care that only good butter is sent out of the country; and it has established dairy schools, where the people are taught butter making. The farmers in the different parts of Denmark have clubbed together and built dairy factories, which they manage themselves. Through such establishments they buy much of their cow feed at wholesale, including a great deal of our Indian corn and cotton-seed meal. They also join together in exporting their butter, and ship it in sealed cans to all parts of the world. Danish butter is so sweet and so well made that it is in demand everywhere.

The Dutch, French, and Swiss, and also the Swedes and the Belgians, are good butter makers, producing not only enough for themselves, but exporting much to other countries. The Russians, until within recent years, made no butter for export; but few of their common people could afford to use it, and their dairy product was small. Now, delicious butter is made in Finland and in other parts of European Russia, and a dairy industry has been established in western Siberia. The government fosters



A Belgian milk seller.

this industry. The Siberian butter is put up in barrels and taken on express trains across Russia to the Baltic Sea, where, in fast steamers, it is shipped to the chief European markets. The most of it goes to London, which buys several million dollars' worth of Russian butter every year.

Shipping Siberian butter to London.

Other far-away dairy lands are Australia and New Zealand, the butter being carried from them in cold storage chambers over many thousand miles of water before it reaches its consumers. The most of this product goes also to London. Indeed, the United Kingdom is the world's chief dairy market; and it annually imports more than one hundred million dollars' worth of butter and a vast quantity of cheese.

The best European butter is delicious. In many of the countries it is made without salt, and in France salted butter is looked upon with suspicion, the people thinking the salt is put in to hide some bad taste or other defect.

In most parts of Europe the cattle are milked in the fields and the milk carried home. In Normandy women drive out to the pastures in little donkey carts, filled with large

Dutch stable and house combined.

cans. They go over the fields to where the cows are grazing, and milk them as they eat, setting down can after can when it is full, until all the cows are milked. In the meantime, the little donkey, still harnessed to the cart, has been allowed to graze where he pleases. After the milking is finished, he is caught, and the cans are gathered up and carried to the milk room at the farmhouse. There the

milk stands until the cream rises, when the butter is made and put up in small rolls or mottes. On market day each roll is neatly wrapped in a white cloth and packed in a little basket with some long wheat straw to keep it from shaking about. In this shape it is carried to the town market, whence it may go to Paris or to some other large city.

The Dutch are among the best dairy farmers of Europe. They blanket their cows when in the fields, to protect them from the cold; in the summer they milk them out of doors, and in winter they sometimes take them into their houses. At least, the stables are frequently under the same roof as the rest of the dwelling, and are kept almost as clean.

Making Edam cheese.

These people are famous cheese makers, producing some varieties, such as the Edam and Gouda, which are exported to all parts of the world. An Edam cheese is almost as big as a football, and is always globe shaped. It usually weighs a little more than three pounds. It is a cream cheese, yellow within, but inclosed in a bright crimson coat.

One of the most common of the cheeses which we import from Europe is known as the Gruyere or Schweitzer, so called because it is made in Switzerland. The Schweitzer cheese is as big as a carriage wheel and from five to eight inches thick. It is exported to all parts of the world.

Another cheese which we consume in large quantities is the Parmesan, which comes from Italy. It is made from skimmed milk, and is at its best when three or four years old. Parmesan cheese is very hard. It is white within, but its coat is so treated with charcoal and oil that it shines like jet. It is often grated and used as a thickening for soups, and with macaroni.

There are many other cheeses, made in different parts of Europe, which are exported to other countries — in all more than one hundred and fifty different kinds. Some of the best of these varieties are made equally well in our country. Indeed, we manufacture nearly all the cheese we consume, and we export to other countries about fifty times as much as we import.

There is one cheese district, however, that we ought to visit before leaving Europe. I mean the mountainous region about Roquefort, in south-central France, where the sheep-milk cheese of that name is made. Roquefort stands far up on the side of a mountain, its buildings being attached to the cliffs. Most of the houses are only one room deep, but they are two, three, and four stories high, looking out over the valley. The mountain behind the town is full of caverns and passages, through which run strong currents of air and streams of ice-cold water. It is in these caves that Roquefort cheese has been cured as long as any one can remember. The caves were known in the days of Charlemagne, and the peasants of this region were milking sheep for such cheese long before Columbus discovered America. Now the business is controlled by companies, which have added to the caves big stone vaults, through which the air from the mountain caverns is conducted.

It is the air, moisture, and cold water of the caverns which give Roquefort cheese its peculiar color and taste. It is white or yellow, with streaks of blue mold running through it, the blue mold coming out on the cheese as it stands in the caves.

Hundreds of thousands of sheep are milked in this region, and each animal gives about a quart of milk a day during the season. The milk sheep are of a breed called

South American milk peddler.

the Larzac. They are white faced, big bodied, long legged, and long tailed. Their tails are never cut, as are the tails of our sheep; and the peasants say that the longer the sheep's tail, the more and the better her milk. The farmers take the fresh milk to the cheese factories which have been built throughout the surrounding country; and the new cheeses are carried from them to the caves to be cured.

In Bulgaria, Hungary, Greece, and Italy, other varieties of cheese are made from sheep's milk.

South America has many cattle, but they are reared chiefly for meat or for draft. On the Argentine pampas we might visit ranches on which are thousands of cows, and yet find the owners using butter imported in tin cans from Denmark or Switzerland. In many parts of South America cheese is made from cow's milk; and a bit of cheese with guava jelly is perhaps the most common dessert of that continent.

Some fine cattle are reared in our little island of Porto Rico. They do not know what hay is, but feed on the coarse grass which, on this island, is green all the year round. In certain islands of the West Indies milk is boiled before it is used; and in some places salt is put in to keep it fresh.

Crossing to Asia, we find that the dairy industry of that continent is small. It is most important in western Siberia, where the Russians make butter and cheese for shipment to Europe. Fast express trains carry the dairy products across Russia to the Baltic Sea, where vessels are waiting to take them to London. The Chinese, Koreans, and Japanese use comparatively little milk, and in their countries butter is almost unknown. In Tibet, a soup made of butter and tea, boiled with water into a thick fatty broth, is considered delicious; and in Hindustan a melted butter, known as *ghi*, is used for cooking and eating. In the Philippines, cows are comparatively few, and in many of the islands good butter and milk are scarce. The milk peddlers go about carrying their wares in clay jars, which rest upon poles over their shoulders, using a hollow piece of bamboo to measure it out to the customer.

In many Asiatic countries the water buffalo, an ugly

beast with great flat horns and hair much like bristles, furnishes milk from which cheese and butter are sometimes made. This animal is somewhat like a cow. It is found in the Philippines, in Siam, Burma, the East Indies, and in Egypt. In Hindustan, Malaysia, Madagascar, and in parts of Africa, there are dairy cattle with humps on their backs; and in South Africa, Australia, and New Zealand there are many fine dairy cattle, the offspring of animals imported from England.

15. POULTRY — CHICKENS, DUCKS, GEESE, AND TURKEYS

THE food we are to consider to-day is amongst the most delicious eaten by man. How many of us have smacked our lips over a juicy young chicken, a fat goose, a duck done to a turn, or that king of the American barnyard, whose final throne is our Thanksgiving table, — the great bronze turkey. Fried chicken with gravy, roast goose and apple sauce, roast turkey with cranberries, or stuffed, it may be, with oysters, — he

has a poor stomach, indeed, who cannot relish any or all of these.

These domestic birds are known as poultry. They are reared in vast numbers in all civilized countries, and there are few savage lands which do not have chickens and ducks. In the United States rearing fowls for their meat and eggs is a great industry, from which comes a large part of our national wealth. A chicken is a small thing, it is true; but the chickens of the United States, when valued at our last census, were worth many million dollars, and the fifteen billion eggs they produced in that year brought more than the product of all our mines of gold and silver during the same time. At a cent apiece they were worth one hundred and fifty million dollars.

We had then about five million farms, upon which there were two hundred and thirty million chickens, more than eight million geese, six and one half million turkeys, and about five million ducks. We have more of each of these fowls in our country to-day.

Suppose Uncle Sam should call them together into one barnyard! What a noise they would make! The millions of geese would hiss at us as we walked by them; the ducks would quack in such a chorus we could not hear each other speak; the turkey cocks would gobble as they proudly brushed the earth with their wings, making a sound like a rushing wind; the crowing of the vast army of roosters would be loud and shrill; and the hens, in a chorus of two hundred millions, would cluck out the fact that they had laid almost enough eggs to give a dozen to every man, woman, and child upon earth, within the past twelve months.

Silver Penciled Wyandotte hen.

We have, in the United States, eighty-seven standard varieties of chickens, some of which have been produced here, and others imported from different parts of the world. The Brahmas, Langshans, and Cochins come from Asia, and are esteemed especially for their fine meat; the Dominiques, Leghorns, Minorcas, and Black Spanish are from countries along the Mediterranean Sea, and are especially noted as layers; while the Plymouth Rocks, Wyandottes, Javas, and others are largely American products, and are excellent meat and egg producers.

In addition to these, we have many other useful breeds of fowls which have been brought from Germany, Poland, France, and England; and also some ornamental breeds which are reared for their beauty or oddity.

Buff Cochin rooster.

The Plymouth Rocks seem to be our most popular chickens for general

purposes. They are hardy, grow rapidly, and are fit for broiling when from eight to twelve weeks old. They lay large eggs all the year round, and are good sitters and excellent mothers. The Wyandottes and Javas are also liked for the same reasons.

White Leghorn rooster.

Some of our chickens of the Asiatic class are very odd-looking. The Buff Cochins have long yellow feathers, not only over their bodies, but on their legs and feet; and the Light Brahmas grow so large that the roosters often weigh twelve pounds or more. The Leghorns are beautiful; and so are the Black Minorcas and Langshans.

English Red Game rooster.

The ornamental varieties of chickens are so strange-looking that they would be regarded as foreigners in the ordinary American barnyard. The white-crested black Polish fowl has a cap or brush of white plumes on its

head, although its body is covered with dark-colored feathers; and the silver Polish hen has a beard. Game chickens, of which there are many kinds, are tall and lean, with short and comparatively few feathers. They are quarrelsome, and the roosters will fight any other roosters that come near them. Bantam chickens are smaller, and they lay small eggs. They are found in many countries, and there are some especially odd varieties in Java and Japan.

The turkey is a native of our continent. It roamed the forests of North America when our forefathers came; and for a long time in the Central and Southern States the pioneers had no trouble in shooting enough wild turkeys to supply their tables. Now the wild turkey has almost disappeared, but his descendants are reared not only all over our country, but in Europe and Asia. The first turkeys which crossed the Atlantic Ocean were taken by the Spaniards from Mexico to Spain. Later, some were carried over to England, and as early as 1541 roast turkey was there regarded as one of the choicest of dainties.

Turkey.

Ducks and geese, on the other hand, are natives of both the Old World and the New. We have many wild varieties of these fowls, although our domestic breeds of them were

imported from Asia and Europe. We find geese and ducks frequently mentioned in history, and pictures of them are to be seen on the Egyptian monuments made many thousand years ago. It was the cackling of the geese in the Temple of Juno that once warned the Romans that their enemies were coming, and thus saved the Capitol; and, in the early ages, geese were reared in great numbers in western Europe and driven slowly down over the mountains to be sold in Rome for food.

There are goose farms in Holland and in Germany today; and in Berlin is a goose market, where tens of thousands of these fowls are sold daily throughout the year. The Germans eat more geese, in proportion to the number of people in the country, than any other nation. They are fond of roast goose, and especially of goose-livers, prepared as *pâté de foie gras*. The demand for this dainty is so great that the geese are treated cruelly to supply it. It has been found that the liver becomes unnaturally enlarged if the bird is overfed, and the farmer crams food down its throat long after it has had all that it would otherwise eat. The goose is sometimes kept tied up close to the fire, in order that lack of exercise and heat may aid in its fattening.

There are ten principal breeds of ducks raised in the United States, among which are the Pekin, Aylesbury, Rouen, Cayuga, and Muscovy. The Pekin is considered the best. It came from China, and has its name from the capital of that country. These birds have white feathers, yellow bills, and lead-colored eyes. They grow large, and their meat is delicious.

Poultry is so common all over our country that any one can easily learn how the different kinds are reared and pre-

pared for the market. The fowls are fed corn, oats, rye, or meal; and they move about over the fields, scratching out worms and eating insects and other things. Sometimes they are sold alive, and at other times the feathers are picked off and the birds cleaned and dressed before

A duck farm in the United States.

they are sold. Great numbers of young chickens are put away in cold storage and sold as the demand for them arises.

But let us look at the poultry industry as it is carried on in some other parts of the world. Our Porto Rican cousins have excellent fowls; and one of the sights of their cities is the poultry peddler, who goes through the streets with a dozen or more live chickens slung over his shoulder.

The legs of the birds are tied together, and their loud squawking is mixed with his cry of the prices. The same man may carry several live turkeys under his arms. Each of these birds has its legs and wings bound tight with strings, and it is then wrapped about with palm bark, so that only the tail feathers and the head show out at the ends.

Javanese poultry seller.

In Java and the Philippine Islands chickens are often brought to the market in wicker crates, with meshes so wide that the birds can poke their heads through; and in Manila turkeys are sometimes driven through the streets and sold, as it were, on the hoof. The Chinese poultryman carries his live wares about in two big wicker baskets tied to the ends of a pole which rests upon his shoulder. The baskets are shaped like half globes, and the birds stand in them and thrust their heads out through the meshes. Other peddlers carry dried fowls, which are as common in China as dried beef is in America. There are packing establishments where ducks and geese are killed, and then split open, cleaned, and dried in the sun. They are then pressed and salted, after which they will keep a long time.

The Chinese are famous fowl raisers. They have books

about chickens, ducks, and geese, as we have. They use certain foods to make their hens lay better, and they believe that the hens which cackle the least over their eggs lay best. Does not this remind us of a somewhat similar trait in ourselves? The boy or girl who boasts the most usually does the least work.

The Chinese seldom eat eggs soft boiled, and some of them think that the best egg is one which is many years old. They have a way of pickling and preserving eggs which turns them as black as jet; and the flavor of eggs so preserved, like that of fruit cake, is supposed to improve as the months go on.

Along the rivers of southern China there are large duck and goose farms, where the birds are carried in great flat boats from one marshy place to another, feeding on worms and snails, which they dig from the mud with their bills. The author has seen duck boats on the Pearl River near Canton, on each of which lived one or two thousand birds, of all ages and sizes. The owners of the boats were Chinese. They wore big hats, blue cotton gowns, and wide pantaloons, which flapped against their legs as they moved about directing their flocks. The men have such control over the ducks that the latter will go off and on the boats when called. The ducks mind quickly, too, and perhaps the better because the last bird on board gets a sharp blow from the bamboo rod of the herder.

The Chinese were hatching chicken, duck, and goose eggs in incubating establishments long before we thought of doing so. Now, many of our farmers have great boxes heated by lamps, hot air, or hot water, in such a way that the eggs in them are kept at the same temperature they

would have if under sitting hens. At the end of three weeks the eggs have hatched into little chicks, which pick their way through the shells into the world, ready to be fed and reared for our tables.

In the Chinese incubating establishments the eggs are placed in baskets filled with heated chaff, and are kept for twenty-four hours in a room warmed with charcoal. They are then carried into another room, not so warm, put into baskets lined with paper, and moved about from day to day. Later still they are wrapped in cotton and laid upon shelves. The heat is so regulated in these rooms that a large number of birds may hatch at one time. During almost the same hour a thousand little bills may pick their way through a thousand pale blue shells, and a thousand soft, yellow, fluffy ducklings voice forth their first baby quacks.

The duck farmers keep track of such hatchings, and are on hand ready to buy the little ones almost as soon as they are out of their shells. The little ducks are carried to the farms, and at first they are fed on rice water and boiled rice, and clear water is given them to drink. As the ducklings grow older, they eat other things, and within a few weeks they are ready to take their ride on the duck boat and to forage for themselves.

The Chinese have ingenious methods for keeping hawks and other birds of prey away from their fowls. The goose or duck herder often has a bamboo whistle fastened to the end of a long whip, so that it makes a shrill noise when he swings it through the air above his head; and the pigeons of North China have similar whistles so tied to their tail feathers that they make a whirring sound as they fly.

Whistles are also used by the natives of Java to protect their pigeons; and both pigeons and whistles are regularly sold in the fowl markets of some Javanese cities.

Pigeons are eaten in many parts of the world. They are usually ranked as game birds; but they have been domesticated, and in our country, as well as in some other places, large numbers are reared for the markets. They are especially delicious when they are three or four weeks old, at which time they are known as squabs, and bring high prices.

In the earlier part of the last century, vast numbers of wild pigeons lived in the forests of the Mississippi Valley. They had extensive breeding places, and their roosts covered large tracts of woods. The pigeons were sometimes so many that they broke down the branches of the trees, and the men living near by often went out in parties to shoot them. The men knocked the birds down with poles, stifled them by burning sulphur under the roosts, and even cut down the trees to bring the pigeons to the ground. The birds were eaten both fresh and salted, and were even fed to the hogs. As the country became settled, these wild birds disappeared.

In addition to the fowls we have already mentioned, there are others of less importance. Guinea fowl are speckled gray birds, about the size of a small chicken, which are reared on many farms for their flesh and their eggs. Peafowl, the males of which are famous for their gorgeous tails, were served at feasts in former times.

Eggs are used as food in all parts of the world, not only the eggs of fowls, but those of certain birds, fish, and even of reptiles, such as turtles. All eggs are nutritious,

but some birds' eggs are so strong in flavor that we do not relish them. This is true of the eggs of the sea fowl found by the thousands on some of the islands of the Pacific Ocean. West of Hawaii are desert islands covered with huge eggs of birds. These eggs are collected in wheelbarrows by men, and are taken to the coast to be shipped abroad as fertilizer and for use in certain manufactures.

Along the Amazon River countless turtles bury their eggs in the sand. The eggs are of about the size of a hen's egg, and are covered with a leathery skin instead of a shell. Each turtle lays more than one hundred eggs, and all together many millions are deposited in a season. The eggs are dug up by the natives and made into turtle oil and turtle butter.

On the Isthmus of Panama and in some parts of South America the eggs of a great lizard, called the iguana, are greedily eaten. Among the greatest delicacies of our own country are terrapin eggs, served in a stew with the flesh of that reptile. We shall learn about fish eggs when we study the food products of rivers and seas.

The only egg which holds an important place in industry and commerce is the hen's egg. It ranks amongst the chief animal products as a wealth producer and food stuff; and rearing hens for their eggs is one of the profitable branches of farming in many parts of Europe. In Denmark eggs by the millions are gathered for the markets of England. The Danish farmers are so particular to ship only fresh eggs, that the man who puts in a bad egg is fined more than a dollar for each offense. As soon as the eggs are brought in to the shippers, they are tested by placing them upon a tray of wire netting and holding

them over a bright light. If the eggs are good, the light will shine through them; but if they are not, they appear dark or muddy. In Russia hundreds of car loads of geese, chickens, and eggs go over the railroads in one year; and the value of these exports alone amounts to many million dollars.

In the Korean markets eggs are sold by the stick. They are laid end to end and wrapped around with straw

A bundle of eggs.

so that ten or a dozen form a long bundle. A string is then tied about the straw between each two eggs, and they are thus kept from breaking.

In our country and in some parts of Europe eggs are brought to the markets in wooden cases with many pasteboard compartments, each of which holds an egg. Hundreds can be carried in this way in a box without breaking, and car loads so packed are sometimes sent from one end of our land to the other.

Our egg industry produces an important part of our national income. The hens of the United States earn for us more than one hundred and fifty million dollars every year. According to the last census they had laid twelve hundred and ninety-four million dozen eggs within the twelve months preceding, or enough to give every man, woman, and child in our country two hundred eggs and leave some to spare.

Almost all our eggs are consumed at home, although in some years we send a few million dozen to England, Alaska, Hawaii, and elsewhere.

16. WILD ANIMALS USED AS FOOD

THE flesh of wild animals has been a favorite food since the days of Noah's great grandson, Nimrod, who, the Bible tells us, was "a mighty hunter before the Lord." In some countries it forms the chief means of supporting life, and many savages depend almost entirely upon it for food. It was the chief food of the American Indians at the time our forefathers came to this country, as it is of the Indians in the northern parts of our continent to-day. There are races in the Philippines who do little else but hunt; and in South America, Africa, and Australia are savages who depend upon the chase for their existence.

Long ago game of one kind or another was to be found all over the world. There were birds everywhere, deer and bear roamed the forests, and upon our plains vast herds of buffalo made a noise like thunder, as they galloped along. As the world became settled, the animals disappeared; some, like the buffalo, dying out almost entirely, and others, such as deer and bear, being crowded back into the lands that are still wild. To-day the chief hunting grounds of our continent are in the mountains and on the plains of the far north, near the Arctic Ocean. There, where it is too cold for man to live in comfort, are the caribou, which compare in number with the buffalo of our past, and also numerous moose, elk, and gigantic bear.

Some of our largest game is found in the Rockies and the Alleghanies; and the finest wild fowl in the marshy

lands along the Chesapeake Bay, the South Atlantic Coast, the Gulf of Mexico, and in the lower Mississippi Valley.

One of the chief wild animals used as food is the deer. With the exception of Australia and South Africa, it is found all over the world; and the pleasure of hunting it has long been sounded in song and story. Who of us does not remember the bold Robin Hood and his band, who hunted in the forest of Sherwood; and who has not, in his imagination, smacked his lips over the delights of roast venison, as prepared by that veteran cook, Friar Tuck?

Even after England became well settled, the richer people had forests, in which they kept deer for food and the chase; and there are extensive woods preserved as hunting grounds in Great Britain, and especially in Scotland to-day. It was Lord Clare, the owner of such a forest, who sent Oliver Goldsmith a haunch of venison, which brought out his poem describing it.

"Thanks, my Lord, for your Venison, for a finer or fatter
Never rang'd in a forest, or smok'd in a platter;
The Haunch was a picture for Painters to study,
The white was so white, and the red was so ruddy;
Though my stomach was sharp, I could scarce help regretting
To spoil such a delicate picture by eating.
I had thoughts, in my Chambers, to place it in view,
To be shown to my friends as a piece of virtu;
As in some Irish houses, where things are so-so,
One gammon of bacon hangs up for a show;—
But, for eating a rasher of what they take pride in,
They'd as soon think of eating the pan it is fried in."

There are more than fifty varieties of deer in the world, and many of them are found on this continent. Our pioneer forefathers hunted deer almost everywhere in the

woods of the eastern parts of the United States. Some are still to be found in the Alleghanies, in the wilder parts of the south, and in the west, even to the Rocky Mountains and beyond. The most common species is the white-tailed deer, which is somewhat smaller than the red deer

Virginia deer.

of Europe. We have also elk and moose, which are amongst the largest of the deer species.

A full-grown elk often weighs a thousand pounds; and the moose is the largest animal now hunted on our continent. A bull moose stands six feet high or more at the shoulders, and its weight may exceed half a ton; its head is large, and its antlers enormous. Moose meat is so delicious and moose hunting so delightful, that the animals have almost disappeared from our country, except in parts of the Rocky Mountain plateau, and in Alaska. They are still found in Montana, and in Ontario,

British Columbia, and other wild parts of British America, even to the shores of the Arctic Ocean.

Our elk also are rapidly passing away. They formerly fed on the prairies, gathering in the autumn at the foothills of the mountains, and feeding there during the winter, after pawing down through the snow to get at the dry grass. At such times they collected together in bands, moving about in companies of thousands. Elk meat formed an important food of the Indians, and elk skins were often used to cover their lodges.

Bull moose.

Even the common small deer are not easy to shoot. They have a keen sense of hearing, sight, and smell; and the hunter must creep up without noise and be careful to have the wind blowing toward him and away from the deer. The animals are very fleet, and can run, trot, and gallop, at great speed. They are good swimmers, and they go into the lakes and rivers during the summer to free themselves of flies and other insects. Often they feed near the water at night. One way of hunting them is in boats after dark. The man puts a bright light at the prow, and hides behind a screen of green branches, which he builds up back of the light. His gun is thrust through the screen, and he keeps his eye along the barrel as he slowly moves through

the water, approaching the deer. The startled animal stands a moment in wonder, watching the light; and the hunter aims at his shining eyes, which catch its rays, and thus kills him.

In Louisiana deer are often hunted with hounds, and in the Alleghanies they are "hounded," or hunted, upon foot. In the Philippine Islands they are trapped by the Negritos with loops of rattan, so tied to the branches which hang over their paths, that the deer are caught by their horns. The loops have slip nooses which tighten as the animals pull away, and the little black men shoot them with bows and arrows before they can get loose.

American bison.

Until the Great Plains beyond the Mississippi River were settled by white men, there was one huge animal which supplied more food than any other. It was a shaggy beast with an enormous head crowned with short black horns, a woolly brown fur, and a tail and hoofs somewhat like a cow. This animal fed upon the grass of the prairies, and its meat was delicious. It was so large that a bull sometimes weighed almost a ton, and a cow twelve hundred pounds or more. This was the American bison or "buffalo."

Such an animal, we can easily see, would supply large quantities of food; and when we learn that it swarmed in

countless numbers over the prairies, we can realize how much it meant to the Indians. As long as the buffalo lasted, most of the red men were able to retain their independence. Its meat was their principal food. They dried the beef in the sun, and powdered it into pemmican, in which shape it could be kept for months.

It is difficult to comprehend the vast extent of this wild meat supply of the past. The buffaloes have disappeared from the plains, and only a few hundred of them are now to be found in our government parks and in some of our zoölogical gardens. At one time they roamed over our continent from Mexico to as far north as the Great Slave Lake, and from the Rockies to the Alleghanies. There were scattered herds on the Rocky Mountain plateau, and some in Pennsylvania and in New York, and even near the place where Washington City now stands.

These animals moved about in vast herds. As late as forty or fifty years ago, they fed by the millions on the Great Plains. In 1868 a traveler upon the Union Pacific Railroad wrote that his train passed through a buffalo herd one hundred and twenty miles long. George Catlin, an explorer, who spent the greater part of his life on our western plains, before the destruction of the buffalo, says that these animals were then so many that their bellowing sounded like thunder, and that the Indians killed them by hundreds of thousands for their skins, which they sold to the white traders for a pittance.

One would not think that such immense herds could be destroyed in a few years; but buffaloes are dull and stupid in many ways, and they easily became the prey of the hunters. White men shot them for food. Thousands of

them were killed for their tongues, or for a single slice from the hump. The rest of the meat often went to waste. When sold fresh it brought only two or three cents a pound. In 1873 one western railroad alone carried a quarter of a million buffalo robes; and more than fifteen hundred thousand pounds of buffalo hides were sold every year.

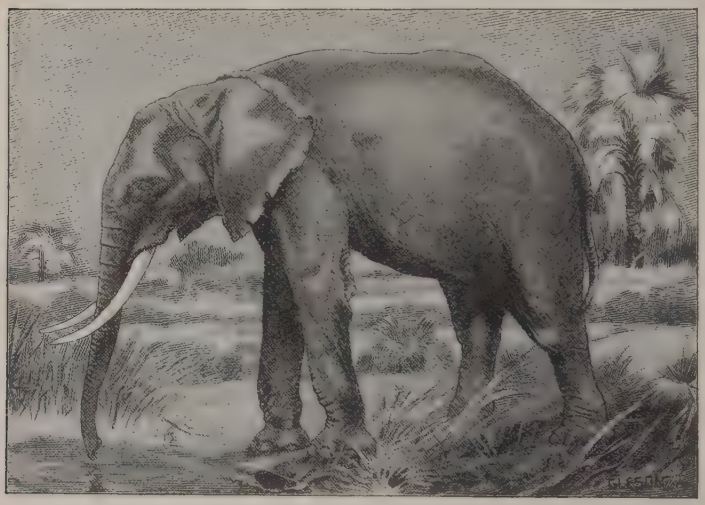
Bear meat was another game food in pioneer days, and it is still eaten in parts of the Rocky Mountains and in Alaska. Bears are native to the wilder parts of Europe, Asia, North America, and the Andean region of South America. They are not found in Australia, nor in Africa, except in the Atlas Mountains. These animals are bulky and clumsy; but they can move rapidly, nevertheless, and are dangerous when attacked. They will stand upon their hind feet and, seizing their enemy in their great arms, will give him a crushing hug, while they tear away his flesh with their teeth. They are especially fond of fish, fruit, berries, grass, vegetables, insects, and honey. They usually live in pairs, each family having its home in a cave or dense thicket, whence they go out either by day or by night to forage for food.

Black bear.

Africa is the chief continent where big game now thrives. It is a land of elephants, hippopotamuses, rhinoceroses,

giraffes, zebras, and countless antelopes. It also has lions, leopards, gorillas, and other wild animals which man does not use for food.

Elephant meat is much prized by the natives, as is also the meat of the rhinoceros and of the hippopotamus. Almost every bit of these animals is eaten, a whole tribe



African elephant.

having a feast after a killing. The best parts of the elephant are its trunk, feet, and fat, and of these parts, the feet are considered the most delicious. They are cooked in an odd way. A hole is dug in the ground and lined with stones. A fire is then built, and when the stones are red-hot, the ashes and coals are removed and the great foot, having been washed, is placed in it. A few sticks are now laid over the top and green leaves spread upon them, and

last comes a thick coating of earth, making a tight covering to this curious bake oven. The foot is left in for several hours, and becomes thoroughly cooked. If the elephant is young, the meat of the foot is so tender that it can be taken up with a spoon.

Giraffes and zebras are also eaten by the Africans, and antelopes are hunted for food by the whites as well as the natives. Many European sportsmen go to Africa for the purpose of killing the big game which there abounds.

17. RABBITS, SQUIRRELS, AND GAME BIRDS

WILD birds, rabbits, and squirrels are amongst the most delicious of foods. Roast canvasback duck, broiled quail on toast, squirrel pie, and young rabbit stew — we smack our lips as we think of them. We have heard their praises sung since we were infants, beginning with the rabbit which papa went to hunt for little "Bye O Baby Bunting," and the "Dainty Dish set before the King," containing four and twenty blackbirds baked in a pie.

Rabbits are trapped and hunted in many parts of our country. Near the foothills of the Rocky Mountains they increase so rapidly that the people turn out in great parties and drive them from a wide extent of territory into one place, where they kill them by thousands. In Australia the rabbits descended from a few pairs imported from England have so multiplied that they are now a great pest. There are many millions of these little animals, and, do what they will, the people cannot destroy them. They are

shot, trapped, and poisoned, but they number more every year; so that now the farmers have built woven wire fences about the pastures to keep them out, and thus preserve the grass for the stock. In New Zealand similar conditions exist, and many thousand wild rabbits are annually killed there, in order that their carcasses may be

A rabbit drive in the west.

shipped to England. The rabbits are prepared in the frozen meat factories, and are exported, with the fur on, across the oceans in cold storage chambers.

Hares are like rabbits, only larger. They are found all over Europe, excepting in Ireland, Scandinavia, and northern Russia. Canada has a species of polar hare, and we have large hares on our western plains known as jack-rab-

bits. These animals are famous for their speed. They leap over the earth in high bounds, covering as much as fifteen feet at one jump. Like rabbits, they increase rapidly, and the farmers in certain sections of our country make hare-proof fences to keep them out of the fields and orchards. The people in these sections sometimes have what is called a "drive." All the men, women, and children gather in a circle about a square mile or more of space, and drive the hares into an enclosure, where they are slaughtered with clubs.

Squirrels are hunted in many parts of the United States. They are found all over the world, except in Australia, and most abundantly in India and southern Asia. They belong to the same animal family as rats; but they live in the woods, some making their nests in the ground, and others in hollow trees.

Gray squirrel.

There are many species of squirrels. Some are gray, some reddish brown, and some black; some kinds are not bigger than a mouse, and others are as large as a kitten. The most common squirrel in our country is the red squirrel, which is only eight inches long. This little animal is found almost everywhere in our mountains. It lives in the trees and subsists largely upon nuts, although it often eats grain, birds' eggs, young birds, and even fruit. The fox squirrel lives east of the Great Plains and in the Southern States. It is quite large, being often

a foot or more long. Its color ranges from gray to jet black, and it has a beautiful bushy tail, which is somewhat longer than its head and body.

The gray squirrel is one of the chief game animals of New England and the North Central States. There is a gray squirrel in California which is noted for its large size and its black tail; while in the southwestern parts of the United States are chestnut-backed gray squirrels which have tufts on their ears. All these little animals are killed with rifles and shotguns; but the rifle is preferred, as it carries but one ball, the hunter trying to shoot the squirrel in the head, so as not to destroy the meat.

Let us now take a look at some of our big feathered game. We have many kinds, the largest of which is the wild turkey. This is much like the tame bird of the same name, and, indeed, it is the parent of the domestic turkey throughout the world. Wild turkeys were once found in all parts of our country, but they have now disappeared, except in the Appalachian Mountains and in the wild lands of the south and the west. They are hunted with rifles, the sportsman often calling them to him with a whistle made of the wing bone of the bird. The call used is an imitation of that of the wild turkey gobbler. After the man has gobbled for a while, any wild male turkey that may be near will answer, and, perhaps, lead his flock toward the hunter. Turkeys always go about in flocks, and they have fixed roosting places. Men hide near the roosts, and shoot the birds by the light of the moon.

Other large game birds common to North America are wild geese and ducks, many of which spend the summer in the cold lands of the north and come south in our au-

tumn, going on farther toward the Equator as the streams and lakes freeze. The Canadian goose, which is the most common, is found in flocks of thousands about Hudson Bay, and even farther north. It forms a large part of the food supply of the Indians and the white fur traders who inhabit those regions. The geese fly southward in such numbers that a flock often looks like a great white sheet spread out in the sky. They feed about our lakes and

Shooting wild ducks.

are attracted by means of decoys, or imitation geese made of wood or iron, placed upon the water. The hunters imitate the call of the geese and thus get them to light or to stop a moment in their flight.

We have wild ducks along our rivers and lakes, and also in the marshy lands of the seacoast, and especially in places like Chesapeake Bay. Shooting ducks is great sport. The birds are wary, and the hunters lie down in boxes

or boats in the marshes, and wait for them to come near. Sometimes the men have blinds or screens of reeds, behind which they lie until the birds come near enough to be shot. They also use decoys painted to look like the living ducks that frequent the flats. These little wooden birds float upon the water not far from the blinds; and when the live ducks come up to make friends with them, bang goes the gun, and the ducks are food for our tables.

The most famous of all these ducks is the canvasback, a handsome fowl with a head of dark chestnut red, a white back, and a black bill and breast. This duck is especially delicious after feeding upon the wild celery of the Chesapeake Bay. It is sometimes called the king of American ducks, and it commands the highest price in the market. Another delicious duck is the redhead, which may be shot along the bays of our Atlantic Coast and also about the Great Lakes and in Canada. Other well-known ducks are the teal and mallard, found on our rivers.

Have you ever eaten a prairie chicken? Its flesh is excellent, and it graces the tables of many families in our Western States. It is also hunted in Canada. These birds are almost as large as some varieties of the domestic chicken. They live in the open country, building their nests on the ground and laying twelve or fifteen eggs before sitting. Toward winter they gather in vast flocks and may sometimes be seen, even in the half-settled country, seated on the fences and about the haystacks. They are hunted with dogs and are not difficult to shoot. They are a kind of grouse, belonging to a bird family of many species, which are found in different parts of the world.

Among the most common of our smaller game birds

is the partridge, sometimes known as the quail. This is found both in Europe and in our country. It is also called the bobwhite, because its whistle sounds like those words.

The bobwhites live in the grass and the bushes, going about in flocks which make a great whirring noise as they fly. Hunters scare up the birds with dogs and shoot them as they rise. A favorite way of serving quail is upon toast, after broiling them over the coals; and a fat young bird so cooked is a dish for a king.

The bobolinks, or reedbirds, are killed by thousands every autumn in the marshes near and along the coasts of our South Atlantic States. They are little birds, one being not much more than a mouthful when cooked, but their flesh is so delicious that great numbers of them are shipped to the northern markets. Snipe are also shot in the marshes. We have other game birds of less value in different parts of our country.

18. FISH IN GENERAL

EVER since our forefathers came to America, fish has formed one of our principal foods. When the Pilgrims went to King James for their charter, they told him they wanted to go to the New World "to worship God and catch fish." They did both, and to-day New England fishermen supply the most of the sea food of our Eastern States. They fish not only along our own coast, but they sail to the Grand Banks of Newfoundland and elsewhere to ply their trade.

The New Englanders, however, are by no means our only fishermen. In this country almost a quarter of a million people are engaged in fishing. This industry is carried on all along the Atlantic and the Pacific Coasts, upon the Great Lakes, upon the Mississippi River and its tributaries, and along the shores of southern Alaska.

A New England fisherman.

Many thousand vessels are required for this work; and the product annually sells for more than fifty million dollars.

Our fish catch amounts to two thousand million pounds in one year. If it were loaded upon wagons, at a ton to the wagon, each hauled by two mules, just about all the mules in the United States would be required to drag the load.

Of this quantity, the larger part comes from our New England and Middle Atlantic Coasts. About one tenth comes from the South Atlantic Coast and the Gulf of Mexico, and an equal amount from the coast streams and the waters of the Pacific Ocean. We annually catch millions of pounds of salmon in Alaska and about one hundred million pounds of white and other fish in the Great Lakes.

The fishing industry of Canada is enormous, and so is that of the United Kingdom, Norway, and other European countries, as well as of Japan, China, and many other parts of the world. The oceans, lakes, and rivers greatly aid in the support of man; and their supplies of food seem to be inexhaustible. Take the herring. It is one of the smallest of our commercial fishes, but, nevertheless, fifteen hundred million pounds of it are eaten in one year. Twenty-five million pounds of cod are annually caught to supply the demand for dried codfish alone.

We can hardly conceive of the immense quantity of food man annually takes from the lakes, rivers, and seas; and one might think that in time the fish would all be caught, and the favorite varieties at least disappear, as have the buffalo and some other species of game.

It is cheering to know that there is no danger of this taking place. As we shall see further on, our government is always planting in our waters such fishes as are likely to give out; and scientists tell us the world's supply of fish is so enormous that there will probably be enough for all time to come. Professor Huxley, for instance, describes the vast shoals of cod found off the shores of Norway which the natives call cod mountains. He says the fish move along in great masses, often from one hun-

dred and twenty to one hundred and sixty feet deep; and he estimates that one such shoal a mile square contains about one hundred and twenty million cod, or enough to give one fish to every man, woman, and child in our land, and leave millions to spare.

Fish increase rapidly. They yield eggs in such quantities as would hush the cackle of the proudest hen, could she but know it. Bertram, in his book "The Harvest of the Sea," says that he counted seven million eggs in the roe of one sturgeon, and that the codfish lays more than three million eggs at a time. Various other varieties of fish lay more or less, but every single fish produces so many thousand eggs that we might think that the waters would soon be solid fish. And so they would be, in some places, were it not that the fish eat each other, the larger varieties feeding upon the smaller; and that birds, reptiles, and men are all fond of this food and use every means in their power to get it.

Let us visit some of our great fishing grounds and observe how these finny creatures are caught and prepared for the markets. We shall first sail along the Atlantic Coast to watch them catching cod, halibut, mackerel, and herring, which are found in great numbers on the Banks, or shoal waters, of the North Atlantic Ocean. Fishermen go out in schooners and other boats, with their nets and lines, often remaining away from home for months at a time. More than seven thousand American fishermen are engaged in cod fishing alone, and their catch annually sells for several million dollars. The Canadians get fully as many, and altogether about twenty million dollars' worth of cod are marketed in a single year.

Cod are found in the Atlantic as far south as Cape Hatteras and as far north as the Arctic Ocean. In the Pacific they swim along the shores of Oregon, Washington, and British Columbia, and also of Japan and southern Alaska. The most of our catch comes from the North Atlantic and especially from the banks off Newfound-

Cod fishing with lines and trawls.

land and New England. According to the laws of nations, the people of any country have the sole right to fish within three miles of its shores, but outside that limit the sea is free to all; and therefore fishermen from all parts of the world can come to any good fishing grounds that are three miles beyond the coast. Men from many different countries fish along the Grand Banks of Newfoundland, which have been long famous for their cod.

Every spring fishing schooners start out from Gloucester, Boston, or other New England ports for the Grand

Banks. They are well supplied with food for the men and salt for curing the fish as fast as they are taken. The boats are good sailers, the captains are well-seasoned ship-masters, and the crews are experienced fishermen. The men are not hired by the day; but they usually work together as partners, each taking his share when the catch

A fishing schooner.

is sold after they return home. The fishermen usually leave in the latter part of May or June and spend several months getting their cargo. They anchor their schooner on some good feeding ground and then go out in small boats to fish with lines and trawls.

Cod are deep sea feeders. They eat all sorts of marine animals, including oysters, lobsters, crabs, and fish; and

they delight in moving along the bottom of the sea. Those caught for the market are usually taken at depths of twenty, thirty, or forty fathoms, the men of a crew often filling a boat at one fishing. At the close of each day the fishermen all come back to the schooner; the boats with the fish in them are slung upon deck, and the cod are

Salting house in Newfoundland.

cleaned, salted, and stored away in the hold. There is great rivalry amongst the crew as to which boat shall catch the most fish, and the life is dangerous and interesting. If you would know more about it, I advise you to read Rudyard Kipling's boy story, "Captains Courageous," in which Harvey, the son of a millionaire, who has always

had his every wish gratified, falls into the sea from the deck of an ocean steamer, while crossing the Grand Banks, and is picked up by a fishing schooner. The captain disbelieves his story of a rich father, and Harvey is forced to work with the men. He helps to clean the cod, to salt them, and to pack them away in the hold. He

Drying cod at St. John's, Newfoundland.

resists at first, but he soon learns to obey, and the hard work and many admirable qualities of the fishermen teach him to respect labor and make a man of him.

After the fish are brought home they are placed in hogsheads filled with brine and are allowed to soak until the time comes for curing them. The cod are then taken out

and dried in the sun. They are now ready to be packed and shipped to different parts of our own and other countries as salted cod, in which shape we may find them in almost any grocery store. We prepare enough dried codfish every year to give one pound to every man, woman, and child in the United States; and we export large quantities to other countries. The chief markets for this fish are France, Spain, Portugal, Italy, and Brazil.

Two other sea fishes exported to all parts of the country are mackerel and halibut. Halibut are found in all northern seas, and our fishermen catch them on the Grand Banks of Newfoundland and even along the coasts of Iceland and Greenland. Some are brought to the markets packed in ice, and others are cured by smoking.

The mackerel is one of the most valuable of the Atlantic food fishes; and catching it is an important industry in the United Kingdom, Norway, Canada, and our own country. These fish swim about in schools so large that if all were caught, one big school would fill a million barrels. Mackerel like to wander. They go into the deep sea in the winter and return to the shores in the spring, swimming northward as the weather grows warmer.

Most of our mackerel fishermen start out from Gloucester, Massachusetts, sailing south in the early spring, to meet the fish when they first appear off the coasts of the Southern and Middle States. The catch is then landed fresh in New York or Philadelphia. Later they go northward to southern Nova Scotia and follow the schools on into the Gulf of St. Lawrence. Many of the best fishing vessels of the United States are engaged in catching mackerel; and in some years one thousand boats have been so

employed. Mackerel are often salted and sold in kegs throughout the country. A bit of salt mackerel, boiled or broiled, is delicious for breakfast, and the Spanish mackerel is one of our choicest food fishes when fresh from the sea.

"Herring, herring, two for a penny,
Ar'nt you ashamed to eat so many?"

This is a common cry among the children of England and also of parts of the United States. Herrings are eaten annually throughout the civilized world to the extent of millions of barrels. Enough are caught in one year to supply one pound to every man, woman, and child upon earth. Most of these fish are taken in the North Sea, although some are caught in our waters.

Herrings are sold in the markets — fresh, pickled, and smoked; about twenty-five million are annually frozen, and a large number are used as bait for cod. In Maine the young ones are extensively canned as sardines, and they are said to taste quite as well as the sardines of Europe, which come chiefly from the Mediterranean Sea and the Bay of Biscay.

Sardines are usually put up with olive oil, in flat cans, the little fish being laid so close together that a common expression for crowding or packing has come to be "as tight as sardines in a box."

In addition to the varieties already mentioned, there are many other sea fish which regularly appear in our markets. Among the most important are smelts, haddocks, sea bass, sheepshead, tautogs, bluefish, and shad. The two latter are caught in large quantities all along the Atlantic Coast, the shad being taken when they come into the sea from the streams to lay their eggs.

Shad is one of the sweetest of all sea foods. Its flesh is rich and its eggs are considered a delicacy; but it has so many bones that it must be carefully eaten. A favorite way of cooking it is to split it open, clean it, and nail it to a hickory plank. The plank is then stood upon end in front of burning coals, and the shad broiled. It is now served upon the charred wood as planked shad. It makes our mouths water to think of it.

19. SALMON

IN 1867, when our government bought Alaska from Russia for seven million two hundred thousand dollars, and thereby added almost one fifth as much land as we then had to the territory of the United States, the purchase was criticised as a shameful waste of the public money. We had bought, so the fault-finders said, a barren desert of snow and ice in an Arctic region, incapable of cultivation, whose only treasures were the seals that might be killed along its coasts. The government was charged with having squandered the money of the people, and it was said that shrewd Russia was laughing in her sleeve over our simplicity.

It may be that Russia did laugh at that time; but, if so, she is probably sighing now; for Alaska has since paid us back her purchase price many times over in salmon alone, to say nothing of millions of dollars' worth of whales, furs, and gold. In 1902 we sold Alaskan salmon to the amount of more than twelve million dollars; and the salmon caught

in one year in the Alaskan streams often bring more than the sum we paid for the whole country.

The salmon is one of the most profitable of our food fishes. It is caught all along the Pacific Coast from the Gulf of Monterey to Alaska, also in the Arctic streams of that territory, including the mighty Yukon. Another variety of salmon is found in the rivers which flow into the northern Atlantic Ocean. Hendrick Hudson reported that he saw salmon in the Hudson River when he first explored it in 1609; and the fish is caught to-day in the waters of Maine and eastern Canada and also in some streams of northern Europe and eastern Asia.

The most important of all salmon are those of the Pacific Coast. They form one of the chief food fishes of commerce; they are eaten almost everywhere in our country, and are also exported to England and other parts of Europe, to China, Japan, India, and the Philippine Islands, and even to Australia and Africa.

Many million dollars are invested in catching and canning salmon. There are some towns, such as Astoria, near the mouth of the Columbia River, where the people do little else; there are others, like Bellingham on Puget Sound, where the canning houses employ hundreds of hands; and there are single factories where as many as half a million cans of fish are put up in one day. From the Columbia River alone, up to the beginning of this century, seventy-five million dollars' worth of these fish had been exported. Vast quantities are annually taken from Puget Sound; and, as we have seen, the product of Alaska is enormous.

There are several species of these Pacific Coast salmon, some large and some comparatively small. The quinnat,

or chinook, is the king of all salmon. In the Yukon River it sometimes weighs as much as one hundred pounds, and in the Columbia River eighty pounds or more. James G. Blaine, our famous American statesman, once received a present of an eighty-pound chinook from his Oregon friends. The great fish was cooked whole, and so served on his dinner table. When we remember that many a good sized boy of ten does not weigh eighty pounds, we can imagine that the platter must have been enormous, and that it took more than one waiter to bring that fish in from the kitchen.

Chinook, the king of salmon.

Such large salmon are uncommon. The average chinook caught in the Columbia for export weighs only about twenty-two pounds, while that of the Sacramento River weighs less. All other species of salmon are smaller, some, such as the sock eye, weighing five, six, or seven pounds, according to the season.

But let us take a flying trip along the Pacific Coast and see something of this great industry. If we would understand it, we must know the life history and habits of this king of fishes, for it is upon them that the industry is founded.

Suppose we start with the baby salmon in one of the icy streams, fed by the snows of the mountains, which flow into the Columbia. Here the salmon is born ; and it spends its babyhood and a part of its childhood moving down with

the waters to the sea, feeding as it goes. It is quite small when it reaches the ocean, but it increases in size from year to year until about four years later, when it is fat and plump and ready to start back up the very same stream it came down. At this time the salmon has solid flesh, it is of a pale red color, and it goes forth in the pride of its strength. It eats but little after leaving the ocean, but devotes itself entirely to making its way back to its birth-place. If one could have the perseverance and the courage that the fish shows on this journey, he could conquer almost any obstacle that might come in his way. It swims steadily onward, making several miles a day, often spending months on the way. It fights against the current, climbs the rapids, jumps over the shallows, often bruising itself sadly upon the rocks, but going on and on until it reaches the place where it was born. A male and a female usually go together; and when they have reached the right spot, they dig a little hole in the gravel of the bed of the stream, and the female there lays her eggs.

After this the fish usually sicken and die; they very seldom get back to the ocean. Their eggs soon hatch into minnows, which feed awhile, just as their parents did when they were little, and, as they grow stronger, start down the river on their voyage to their ocean home.

This is the story of one pair of fish, but it is also the story of millions upon millions. The salmon come up in vast shoals or schools, sometimes crowding the streams so that they look like solid fish. In Puget Sound, at certain times of the year, the fish blanket the water in places, so that, with a small boat, one can row several miles through fish.

As the salmon take the same course year after year, the fishermen know just about when and where to expect them. In Puget Sound great cagelike nets are sunk off the shores of the islands. The nets wind about like the mazes of Rosamond's bower; and, as they are set directly in the course of the fish that are journeying to the rivers, the latter

Salmon fishing with nets in Puget Sound.

become entangled in the nets. The salmon swim from one enclosure to another until at last they fall into a great trap walled with netting, which will hold thirty or forty thousand salmon at one time. When the trap is full, the fish are turned out into big scows by lifting up one end of the net, or they are ladled out with dip nets which are sometimes worked by a steam engine. As many as ninety

thousand salmon have been caught at once in such a trap. When the scows are full, they are towed by steam tugs to the canneries.

In the rivers salmon are caught with traps, nets, and water wheels. The Indians spear them and also catch them in dip nets, as they jump up in surmounting the rapids. Gill nets, often a quarter of a mile long, are stretched across the course near the mouth of a river. The salmon

Fish wheel in the Columbia River.

push their heads through the meshes, and are caught by the gills as they attempt to pull out.

Far up the Columbia River, where the current is swift, great fish wheels with wire nets attached to their rims are fastened to scows in such a way that the salmon, swimming up, strike the nets; and the wheel, turned by the river, raises them into the air and pours them into the boat. More than thirteen thousand salmon have been caught in this way by a single wheel in one day; and all the fisherman

did was to sit down and watch the fish dropping by twos and threes into his boat. Sometimes so many fish have been taken by a wheel, that the boat has become overloaded and sunk. Boats used for this purpose hold five or six thousand large fish.

Canning salmon is almost as interesting as catching them. The work is carried on by very similar methods at

Sock eye salmon ready for the cannery.

the great establishments at Astoria, on Puget Sound, and in Alaska. The buildings are usually at the water's edge, so that the vessels may come alongside and deliver the fish, or take away the packed product. Most of the factories are large, roomy, one-story frame structures, with lofts for storage and, in some cases, for the manufacture of cans. In the

more modern establishments much of the work is done by machinery. The salmon are pitched into conveyors and carried to the killing room, which is kept clean by flooding and scrubbing it every night with salt water. The fish are first placed upon long tables, about which stand a score or more Chinese, who cut off the fins, heads, and tails, and throw the bodies upon an endless rubber belt which carries them to the cleaning machines. Here the scales are taken off, the entrails removed, and the fish washed and dressed at the rate of forty-five per minute. The fish is held by automatic clamps, which press its body against a sharp knife that splits it open. A series of scrapers and brushes, aided by a stream of water, washes out the inside and finally dumps it into a tank of running water. It next goes through a series of rapidly moving circular knives which cut it up into pieces of just the size used for the cans. The cuts are now carried to long tables, where they are packed by young women. The filled cans are cooked slightly by steam and then capped and soldered and cooked again. During the second cooking a little hole is made with a steel point in each can to let the vapor and air escape. After this the holes are soldered up and the cans run into another steam chamber, which thoroughly cooks the salmon and softens the bones. The cans are now ready to be varnished and labeled and put up for shipment. They are packed in wooden cases and in this shape find their way to grocers all over the world.

The Chinese and Japanese who clean the salmon come by thousands from San Francisco and other cities for the fish season, a large number of them being employed in Alaska.

20. OYSTERS

"The herring loves the open sea,
The mackerel loves the wind;
But the oyster loves the quiet tide,
For it comes of a gentle kind."

THIS verse of an old song gives us one of the characteristics of a sea food which has delighted man's palate for ages. The Romans, who were noted for their dainty viands, served oysters at their feasts. They caught them in the Mediterranean and even imported them from Great Britain after Cæsar conquered that country. Sallust, a Latin writer who lived a little before Christ, wrote thus of our English ancestors: "The poor Britons — there is some good in them after all; they produce an oyster."

In the Middle Ages oysters were eaten in different parts of Europe; and since then poets have often sung their praises. Shakespeare probably knew them well, for he uses the word "oyster" several times in his plays; as, for instance, in "The Merry. Wives of Windsor," where Pistol, upon Falstaff's telling him he will not lend him a penny, replies: —

"Why, then, the world's my oyster,
Which I with sword will open."

To-day oysters are eaten in great quantities in Europe and in North America, Asia, and Australia. The city of London alone consumes more than a billion raw oysters every year. The United States produces so many that we could annually give one dozen to every man, woman, and child in the whole world, and have some to spare.

When our forefathers landed in America they found oysters in abundance. They were probably eaten ages ago by the Indians; for vast quantities of oyster shells have been discovered in ancient Indian shell heaps. Oyster fishing is now carried on all along our eastern coast from Florida to Massachusetts, and also in the Gulf of Mexico, the Gulf of California, in San Francisco Bay, and in the waters off Oregon and Washington. Our most important fisheries are in Chesapeake Bay, mainly upon natural beds, and in Long Island Sound, where the oysters have been planted by sowing their eggs.

It seems strange to think of rearing oysters like chickens, or of raising them by planting the eggs as seed and reaping the crop after a certain number of years; but this is the custom in most of the oyster-producing parts of Europe and of our country. The French are famous oyster farmers. Upon one oyster bed of less than five hundred acres in France, a million dollars' worth of oysters have been raised. There are also some fine oyster farms in England. Near the town of Whitestable not far from London, there are twenty-seven square miles of them, which yield an annual product of more than a million dollars.

Until within a few years, almost all our oysters came from natural beds. Now the government has planted the eggs of the Chesapeake oyster along the shores of our Pacific States, as well as in Chesapeake Bay and at other places upon our Atlantic Coast; and we are growing many oysters in this way. Indeed, it is estimated, that if all the oyster beds of Chesapeake Bay were properly planted and cultivated, they might produce many times the amount

they now do and bring in a product of six hundred million dollars a year.

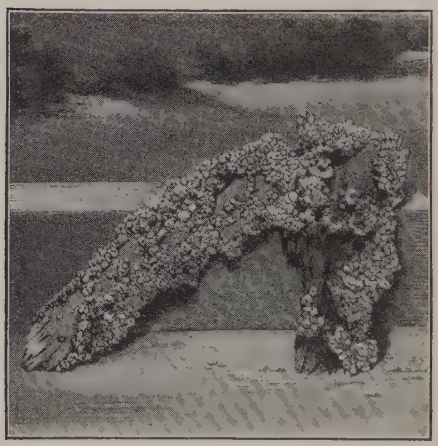
Our consumption of oysters is so great, and their other enemies, such as fish, sea worms, barnacles, and little snale-like creatures known as drills, are so many, that it is a wonder they have not long since disappeared. The drill has a rasping tongue, with which it makes a tiny hole in the shell and thus extracts the soft parts; while the oyster-boring sponge consumes the shells, until they are like a honeycomb and may be crumbled to powder with the fingers. Oysters are also eaten by the starfish, which sometimes sweep across the beds in large schools, devouring the oysters in their path.

Nevertheless, even if man did not plant it, the oyster would increase rapidly enough to keep from becoming extinct. If it had no enemies at all and its every egg should become a full-grown oyster, the shores of all the oceans could hardly contain the product at the end of a few hundred years. A single Chesapeake Bay oyster lays from sixteen million to sixty million eggs in one season. The eggs are so small that they cannot be seen with the naked eye. They come from the oyster in a sort of a cloud or milky spray which floats out upon the water and which soon hatches out into tiny oysters.

Oysters, when first hatched, are not bigger than the point of the finest needle. They are delicate and susceptible to cold. They move up and down in the water and finally attach themselves to some other body, such as a stone or shell. They grow gradually; at first they look like white dots, a little later they are as big as a pin head, and at the age of one year they reach the size of a silver twenty-

five cent piece. After that, if healthy, they should grow about an inch each year, until they are three or four years old, when they are of full size.

The oyster is one of the strangest of all animal creations. It has a mouth, but no head. The mouth is merely a hole at the narrowest part of the body, and it contains neither tongue nor teeth. It is bordered by four thin lips, and the oyster gets its food by filtering sea water through these lips. The food consists entirely of minute animal and vegetable organisms and small particles of matter found in ordinary sea water.



Young oysters growing on a stump.

The oyster has neither ears nor nose, but scientists tell us that it is able to see in some way and that it will close its shell if a shadow passes over the water. Its stomach consists of a bag which lies just behind the mouth and is surrounded by the liver. It has lungs which are like the gills of fishes, and also a heart, as one of the muscles is sometimes called, but no brain.

Its shell, or house, consists of two valves fastened by a hinge at one end, and so arranged that they can be opened and shut at will. While the oyster lies undisturbed on the bottom of its bed with its shell open, the sea water

is drawn in and out, thus giving it air and food. The shell is a tiny coat at first. It thickens from year to year, so that one can tell how old an oyster is by the layers shown upon the outside of the shell. Shells have been found which were nine inches thick, and some scientists claim that oysters have lived one hundred years.

Oysters are harvested during the fall and winter, by men who sail in big boats over the beds. They use rakes

Oyster dredging.

and dredges, and sometimes oyster tongs or huge pincers, picking and scooping the shells from the bottom of the sea.

When the boats are loaded, the catch is carried to the markets or to packing establishments, where the shells

are shucked off and the oysters put into tubs or cans for export to all parts of the country.

The largest oyster-packing centers of the United States are upon the Chesapeake Bay, from which many millions of oysters are shipped annually. They are sent in boats

Shucking oysters.

and cars to our chief cities and towns. The business of preparing them for the market employs many thousand hands.

Suppose we enter a Baltimore factory and see the shuckers at work. The building stands on the edge of the harbor. As we come up, great boats filled with oysters in the shell are being unloaded, and a strong smell of the salt sea fills the air. There are men on the wharf shoveling oysters

into wheelbarrows and carrying them into the shucking shed. We follow and enter a long low half-dark room, in which, at high tables, which run lengthwise from one end of the room to the other, stand several score of men and women working away. Some are colored and some white, and all are busy. Each has a sort of desk before him, upon which is a block with a chisel blade fixed upright in it. He has a wooden mallet in one hand; with the other he picks up an oyster and lays the edge of its shell on the blade. Now he strikes it a quick blow with the mallet, cutting it through. He next thrusts a broad-bladed knife into the gap and opens the shell. A scoop of the knife then severs the muscle which attaches the oyster to the shell and, long before its breath is out of its body, it finds itself cold and naked in a bucket with its brothers and sisters which have been shucked just before.

When the buckets are filled, they are carried into another room. Here the oysters are washed and put up in five-gallon tubs, with a little ice spread on top, and they are then ready for their railroad journeys to other parts of the country.

Some oysters are packed up in sealed cans for shipment; some are sent away in the shell, in barrels; and others are pickled with spices, and bottled. In many cities on or near the seacoast, the oysters are delivered in the shell; and each dealer opens them for his customers.

Oysters taste best when fresh from the shell, and they are frequently served raw, on the half shell, at the beginning of a dinner. Indeed, oysters are usually eaten raw in all European countries. In the United States they are also served in soups and stews, broiled, fried, roasted, and

escalloped, and in pies, curries, and turkey stuffing. We usually eat oysters only in the months which contain the letter "r," beginning with September and ending with April.

21. LOBSTERS, SHRIMPS, CRABS, AND OTHER SHELLFISH

THE crustacea are sea animals so named for the hard shell of armor which completely covers their bodies. There are more than ten thousand species of crustacea, including lobsters, crabs, shrimps, prawns, and other salt and fresh water creatures. The smaller kinds drift in myriads about the shores of the oceans and Great Lakes, while some of the larger varieties are amongst the most delicious of the sea products eaten by man.

Lobster.

The lobster, which is the biggest of the crustacea, has a white meat so sweet that it always brings high prices, and so largely consumed that lobster fishing is an important industry, our catch often amounting to millions of pounds in one year.

Lobsters are found all along the Atlantic Coast of our continent from Labrador to Delaware Bay. The greater part of our catch comes from the waters of Massachusetts and Maine. They are taken in traps three or four feet long, made of lathes and stout cords, each of which

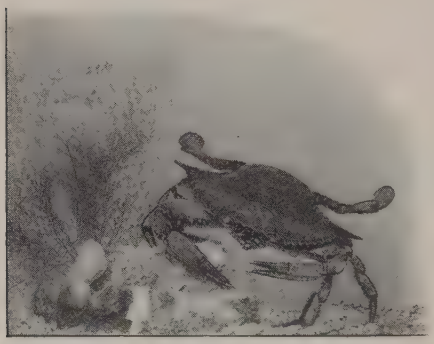
will hold several lobsters. The animals feed upon fish, snails, and other things found on the bottom of the sea; and the traps are baited with meat or dead fish and set not far from the shore, at depths of from twenty-five to two hundred feet. They are pulled up every few days, and the lobsters are taken out and kept in floating cages until enough have been gathered for a shipment to be made. We also get lobsters from the Atlantic Coast of Canada. Steamers fitted with tanks containing salt water run from Newfoundland and Nova Scotia to Boston and New York. At these cities the lobsters are unloaded to be sold in the markets or to be transferred to similar tanks on railroad cars and sent to our interior cities. By this means we are able to have fresh lobster a thousand miles or more away from the sea.

The natural color of the lobster is grayish green, but when boiled it turns a brilliant red, whence the expression "as red as a boiled lobster." The same is true of shrimps, shellfish somewhat like lobsters in miniature. Shrimps are only about two inches long; but they are so numerous upon our South Atlantic Coast, in San Francisco Bay, and elsewhere that they form an important sea food.

The different varieties of crabs are so strange that it would take a long time to describe them all. There are fresh water crabs and crabs of the sea, crabs of different colors, and crabs large and small. The pea crab, sometimes found in oysters, is not larger than one's little finger-nail, while the giant crab of Japan is a foot wide and eighteen inches long, and its legs at the front often measure fifteen feet from tip to tip. Another large crab is the

stone crab of Tasmania, which weighs twenty-five or thirty pounds, or as much as many a three-year-old child.

The chief crab used for food in the United States is the blue crab, which lives in the waters along our Atlantic Coast and in Chesapeake Bay. It is taken in wicker traps, baited with meat, or in baited hoop nets, which are hauled up rapidly from time to time to remove the catch.



Blue crab.

Another method of crab fishing is to use a line with a piece of raw beef tied to it. The crab grasps the meat with its claws, and it may then be slowly drawn to the top of the water, where it is caught with a hand net.

Crabs are always shipped alive to the markets. They are packed in wet seaweed and are taken out one by one when sold. A man must be very careful in handling them. Each crab has two front claws which open and shut like a pair of pincers, and when it takes hold it is almost impossible to make it let go. I should not advise any boy or girl to play with the front claws of a crab.

Like all the crustacea, crabs shed their shells from time to time and grow new ones. They are considered especially delicious when caught just after the old shell has split open and dropped off. The skin is then as smooth as satin and as soft as the cheek of a baby. Even the small

legs are tender, and the flesh is firm, white, and delicious. Every bit of the creature can then be eaten, if it is cooked at once; but, if left in the water, the skin soon becomes rough, and within a short time turns to a shell which grows harder and thicker from day to day.

Crabs which have just shed are known as soft shells, and those upon which the shells have become old and tough are called hard shells. Both are liked as food. A not uncommon dish is deviled crab, which is made by boiling the animal in the shell, removing the meat, seasoning it, and replacing it in the shell to be baked.

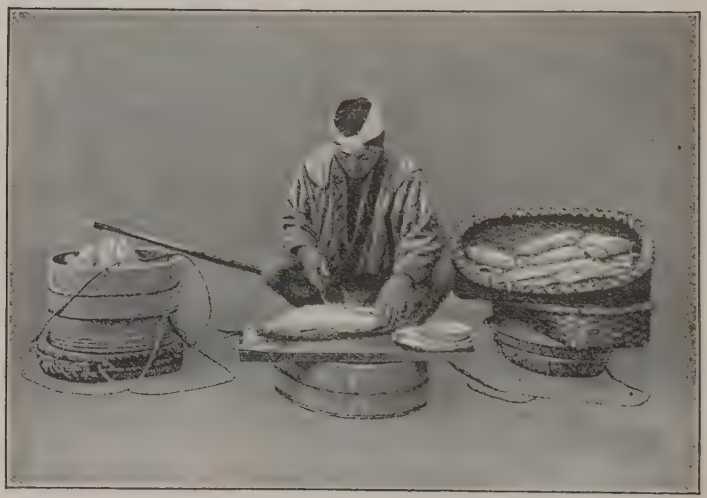
In addition to the sea food we have already considered, there are many other fish and shell animals that are used

Clams.

upon our tables. Almost every locality along our coasts is famous for one kind of sea food or another; and our lakes, rivers, and streams swarm with fish of many species. Clams, which are somewhat like oysters, abound on the shores of the Atlantic Ocean, from Cape Cod to Florida. They are gathered from the sand or the mud in which they bury themselves, and are shipped to the markets in such quantities that the industry is of commercial importance.

22. SEA FOOD OF OTHER LANDS

TO-DAY we shall leave North America and take a flying trip across the oceans, to learn about fishing and sea food in other parts of the world. We shall start with Japan. That country consists of many hundred volcanic islands, some large and some small. The waters are



In a Japanese fish market.

deep a short distance from the shores, and they swarm with all kinds of fish. The Japanese have more than a thousand varieties of sea food, and fishing is one of their principal industries. Their annual product of sea food amounts to many million dollars. They have more fishermen in proportion to their population than we have, and

so many fishing vessels and boats that one is seldom out of sight of these craft in Japanese waters.

The Japanese eat fish prepared in all sorts of ways. They roast, stew, and fry them; they have baked fish, smoked fish, dried fish, and fish soup. They even eat some kinds of fish raw. A favorite fish for this purpose is the *tai* sliced thin and brought to the table ice cold. It is eaten with chopsticks, each morsel being dipped in *soy*, a kind of sauce, just before it is put into the mouth.

During their war with the Russians, the Japanese fed their armies largely upon fish, sending to the field millions of pounds of dried and smoked bonito.

The bonito abounds off the coasts of Japan. It is a round fish which, when grown, weighs three or more pounds. It is caught in great nets and cured and smoked after the bones are removed. When thus prepared, it becomes so dry and hard that it will last for an indefinite period. Insects will not touch it, and it can be carried anywhere. Bonito is usually eaten with rice; or it may be shaved into thin slices and cooked in a soup.

Almost every species of fish we have in the United States is found also in Asiatic waters. The Japanese have mackerel, halibut, and herring, and likewise shellfish, prawns, shrimps, crabs, oysters, and clams. They catch great quantities of sardines, and even salmon, although their salmon is not so good as ours. Some of their best fishing grounds are about the island of Sakhalin, the southern half of which was ceded to the Japanese at the close of their war with the Russians.

Both Japanese and Chinese have water farms which give them a great deal of food other than fish. Indeed, it

is said that some portions of the Bay of Tokio produce so many water vegetables that an acre yields an annual profit of several hundred dollars. The Chinese farm their waters in the same way. The Japanese gather seaweed and dry it, cooking it with soup; they also use it to make

Drying seaweed in Japan.

a vegetable isinglass, which is consumed not only in Japan, but is exported to Europe, North America, and even to China.

The Chinese are among the great fish eaters of the world. There are so many fish in southern China that one may have a different kind for breakfast every morning of the year, if he will eat every sort that the Chinese do. Not only the sea, but also the rivers and canals, are filled with fish; and there are fishermen everywhere. So many fish traps are built at intervals out into the inland water ways that the boats sometimes scrape them as they pass by. There are fishing platforms upon the river

banks; and one often sees a half-naked man raising or lowering a great net into the water.

The Chinese train otters to catch fish for them; and a not uncommon sight in their rivers is a long boat, on the edges of which a score or more cormorants sit, waiting for their Chinese master in the stern to order them to dive down into the stream and bring up fish for him. The cormorant is a bird almost as large as a good-sized duck and

Chinaman with trained cormorants.

not unlike it in shape. It has a wide mouth and a pouch on the under part of its neck in which it can store a number of fish until it is ready to eat them. It can dive with great force and can swim under water so fast that few fish can escape it. The cormorant usually catches a fish by the head and swallows it head first, so that the fins, being laid against the sides of the body, do not hurt the throat of the bird.

Cormorants are trained for fishing. They are often raised

in captivity, being hatched under hens. When they are about two months old, the trainer takes them in hand and, tying a string to one leg, drives them into the water. He throws them small live fishes, which they are expected to catch, and teaches them to go out and come back at the call of a whistle. The birds that do not obey are whipped with a piece of bamboo.

When out fishing for its master, the cormorant is fastened to the rim of the boat by a string tied to one leg. At a given signal it slides down into the water and dives for a fish, coming up with one in its mouth or pouch. Its master then makes it disgorge. It is prevented from swallowing the fish by a strap or ring which is fastened about the throat below the pouch. When a bird grows tired, the fisherman removes the strap and rewards it with a share of the fish it has caught.

The fish markets of China are interesting. Fish are usually sold alive, being kept in tanks or tubs of running water while awaiting purchasers. However some fish are sold dried and pickled, smoked, or cured in other ways. The Chinese eat water plants and delight in some varieties of sea food which are unknown to our markets. One of their favorite dainties, for instance, is the fins of the shark, cut off and dried in the sun. They boil such fins with wood ashes and then scrape and wash them until perfectly clean: after this they stew the fins and use them in soups or with crab meat and ham.

Another costly sea food much prized by these people is *bêche de mer* or trepang, a great sea worm, or slug, found along the Great Barrier Reef off eastern Australia and the islands about. *Bêche de mer*, as they lie in the water, look

much like large cucumbers, and they are sometimes called "the cucumbers of the sea." They are from one to four feet in length and from two to four inches thick. They live on the microscopic shellfish which are found in great quantities upon coral rocks. About the mouth of each slug are hundreds of little feelers with which it brushes the rocks and thus draws the food into its throat. These queer creatures are picked up at low tide by the fishermen, or are obtained by diving for them. They are cut open and cleaned, and then boiled and laid in the sun to dry. They are now smoked for twenty-four hours, when they are ready to be packed up and shipped off to China.

Filipino casting his net.

The waters about our Pacific islands swarm with sea animals; and Porto Rico, like most of the West Indies, has excellent sea food. The natives of the Philippines live largely upon fish, and they have a great variety of nets and traps for catching them. In sailing along the coasts or upon the rivers and lakes of that far-away colony, one frequently sees the Filipino fisherman casting his net; and one often passes winding cages of bamboo cane stuck down in

the sand in such a way that the fish can swim in, but cannot find their way out. Off the shores of some of the islands are large fish corrals, fenced in with bamboo canes woven together with rattans. These corrals are so hidden at high tide that the fishes swim in, but, when the tide falls, they find themselves caught, and the fishermen scoop them out with dip nets, killing the larger ones with their spears. Everywhere along the coast and streams the natives have small fish traps, and, sometimes, bamboo cages somewhat similar to ours for trapping lobsters.

How would you like to walk out into the fields near home, and be able to catch fish in almost every mud puddle? This is possible in parts of our Philippine Islands. The lowlands of some sections are so underlaid with water that on breaking through a thin crust of earth, a slimy mud is reached, in which several different species of mudfish are found. Some are quite small and others a foot or more long; but they are so plentiful that after a heavy rain the ditches and small streams are almost filled with them. The Filipinos go out after the rains to fish in the rice fields; and during the wet season one may often see men and women wading about in the mud, with fishing traps of bamboo, in the shape of barrels open at both ends. The fishermen push these traps through the muddy water into the beds of the irrigating canals, and then feel down and around to learn what they have caught.

Fish of many kinds are sold alive in the markets of Manila, being kept in bamboo baskets so tightly woven that they will hold water. Upon making a sale, the peddler takes the squirming fish out of his basket, lays it

upon a stone, and kills it by striking it just back of the head with a club.

Going northward to Siberia, we find valuable fishing grounds all along its eastern coast. The Russians annually catch several hundred million pounds of fish, trepang, and crabs in their Asiatic waters; and the natives of northern and northeastern Siberia feed not only themselves, but their sled dogs on fish and blubber. The Eskimos of our continent also feed their sled dogs on fish, and the flesh of the walrus and other sea animals.

The Russians have rich fisheries in their European rivers and seas. There are many fishing boats on the Volga, Don, Neva, and Dnieper rivers, and also on the Sea of Azov, the Black Sea, and especially on the Caspian Sea.

An important industry about the Caspian Sea is catching sturgeon for their eggs, which are salted, cured, and sold as caviar, an appetizing dainty, often eaten upon toast at the beginning of a meal. Caviar looks much like bird shot sprinkled with water. It has a bitter, salty taste; and I doubt whether you would like it at first. It is put up in kegs or cans and shipped to all parts of the civilized world. It is now made in the United States, from sturgeon caught in our waters, but by no means in such quantities as in Russia, which might be called the chief caviar country of the world.

The fisheries of the Baltic are extensive, as are also those of the North Sea. From these places comes most of the sea food of London, which has perhaps the largest wholesale fish market in the world. This is Billingsgate, situated in the heart of the city, not far from London Bridge. Steam vessels scurry about the North Sea and

gather the fish from the places where they are caught and bring them to the mouth of the Thames River. Here larger and faster boats are waiting to carry them to London. In addition, vast quantities of fish are brought in by railway and steamer from Ireland and Scotland, so that altogether many thousand tons are marketed daily.

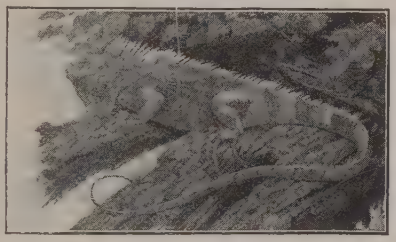
A Scotch fishwife.

The fish are of almost every species, from whitebait, one of which is as big as a baby's finger, to great sturgeon, which sometimes weigh as much as a full-grown man. There are the herring, sole, salmon, and haddock, as well as eels, prawns, shrimps, and smelts.

The fish are sold at auction; and there are thousands of peddlers and retail dealers who push this way and that as they bid. There are vehicles with boisterous drivers and also porters and wheelbarrow men. Indeed, the early morning sales at Billingsgate bring together one of the noisiest crowds of the world. The place has long been so notorious for its confusion and coarse language, that "talking Billingsgate" is a common expression for using slang or scolding in a vulgar manner.

23. TURTLES, FROGS, SNAILS, AND LIZARDS

FROGS, turtles, snails, and lizards! Do people eat such things as these? Yes, indeed; in many parts of the world they are classed among the choicest dainties. Turtle soup is delicious, and the diamond-backed terrapin is a famous American delicacy. In our own cities frogs are in demand; they are caught by the thousands; and snails so delight the Parisians that small farms are devoted to rearing them. The great iguana lizard, which abounds on the Isthmus of Panama, has flesh which tastes like young chicken.



Iguana lizard.

The turtle is a shell-incased reptile with four little legs ending in feet with sharp claws, a short tail, and an odd snakelike head attached to a long flexible neck. Most turtles can draw their heads, legs, and tails within the shell, so that they are protected by it as though covered with armor. Some turtles have sharp teeth, and, when they take hold, it is almost impossible to make them let go without chopping off their heads.

Turtles lay eggs, digging holes for the purpose in the sand or mud. After the eggs are deposited, the turtle smoothes the earth over, the eggs are hatched by the warm sun, and the little turtles pop out. Turtles lay their eggs in the same places year after year, and they are

frequently caught by men who know their breeding grounds and who capture them while they are making their nests.

Turtles are of many varieties. One found in some of the warmer parts of the Atlantic and Pacific Oceans, is so big that, when full-grown, it would make a cart load for a horse; and it has such powerful jaws that it can take off a man's finger at a bite. In catching such a turtle, the hunters are careful to keep away from its mouth. They rush up to it and turn it over on its back, as it lies on the sand. It is then helpless, and can be dragged to the ship, which is to carry it to London or to some other market for sale. Enormous turtles were formerly found in great numbers upon the Galapagos Islands, off the Pacific Coast of South America. A specimen which was kept for two years at the New York Zoölogical Park weighed over three hundred pounds.

Giant turtles, Galapagos Islands.

On the banks of the Amazon there are turtles which lay so many eggs that the natives make an oil of them for cooking and lighting. The people know the laying seasons, and they then go out in crowds to the breeding grounds. They dig up the nests with spades and put the eggs in great piles, until all have been collected. Then each little party takes its heap of eggs to an empty canoe and mashes them into a filthy-looking mush. The eggs are as big as hens' eggs, or a little larger, and they have leathery shells which can be easily broken with sticks or with the feet. Sometimes the Indian boys and girls take off their clothes and jump up and down, treading the eggs, and smearing themselves with the yolks as they do so.

After the stuff is thoroughly mixed, water is poured into it and the sun allowed to beat down upon it. In a short while an oil rises to the top and can be skimmed off. It is afterward refined by cooking in copper kettles over the fire; and then it is stored for use as needed. It is said that about six thousand eggs are needed to make one jar of oil; and the eggs annually destroyed for this purpose amount to many millions. Indeed, Henry W. Bates, from whose travels on the Amazon we get this information, says the destruction of the eggs for this purpose is so great that the Amazon turtle may in time disappear, especially as the natives also collect the newly hatched young for eating.

The favorite turtle of the United States, and, indeed, one which has become noted for the delicacy of its flesh, is the diamond-backed terrapin, found in the salt marshes along our Atlantic and Gulf Coasts from New York to Texas and especially in the Chesapeake Bay. This turtle

is a pygmy in comparison with the great ocean turtles. It is usually from five to seven inches long, and it seldom grows to be more than ten inches long. When first hatched, it is about a half inch in diameter, and it grows at the rate of an inch a year for four or five years, and after that more slowly.

The diamond-backed terrapin feeds largely upon shellfish and small reptiles, varying its animal food with the tender shoots and roots of such plants as grow in the marshes. It spends most of the summer in the swamps. At the beginning of winter it buries itself in the mud at the bottom of some pool or stream and remains there until spring.

The terrapin is so delicious that it always brings high prices in our city markets. A single fat turtle of this variety will sell for several dollars; and there are many terrapin fishers who go about our coasts, wading through the swamps and poking down into them with rods to find where the terrapin nest. They also turn up the mud with spades and sometimes use dredges to drag the diamond-backs forth from their haunts. Terrapin are also trapped by very similar methods to those used for trapping lobsters, the traps being baited with fish. On some of our southern coasts they are hunted with dogs, the dogs trailing the turtles to their nests in the grass or bush and barking to show where they lie.

Terrapin farms have been established for the purpose of determining whether the animals cannot be profitably raised. Our government has fenced in experimental ponds in Maryland and in North Carolina and stocked them with thousands of diamond-backs, the eggs of which are

used to supply the marshes from which terrapin have disappeared.

Have you ever eaten the fat hind legs of a frog, fried to a turn? They taste like young chicken and are so much sought after that in the United States alone we kill millions of frogs every year. It is said that we eat more frog legs than any other people, even the French. Frog catching has become a business in some localities in Minnesota, California, Missouri, New York, Arkansas, Maryland, Virginia, Ohio, and Indiana. The best places for catching them are along the marshes of our lakes and rivers.

Frogs are caught with lines baited with worms, insects, or pieces of red cloth; they are speared; and they are also shot with guns and crossbows. The best time to hunt frogs is at night. The sportsman uses a lantern, the light of which enables him to take aim and, at the same time, blinds the eyes of the frog.

Bullfrog.

Sometimes the frogs are sold alive, but they are usually dressed before they are carried to the markets. In Paris I have seen skewers filled with frog legs, which were selling for a few cents a dozen. In our country the legs are usually sold by the pound, and the live frogs at so much apiece.

In the United States the chief frogs eaten are bullfrogs, green frogs, and spring frogs. These species are much the same, although there is a difference in size, the bull-

frog, which often has a body eight inches long, being the largest.

We have all heard of snails, the little round shell animals which move so slowly, although we may not like Shakespeare's comparison of them with ourselves, when he says: —

> "The whining schoolboy, with his satchel
> And shining morning face, creeping like a snail,
> Unwillingly to school."

The ordinary American boy does not whine, and he usually goes on the run after he has his first pair of trousers and top-boots. He is not like a snail, and it is pretty certain that he does not eat snails. It is different, however, with the boys of southern Europe and especially with those of France. They consider snails a delicacy and eat them in large quantities. Snails are sold in all the French markets. I have seen bushels of them in Paris and have watched the market women dishing them out to their customers at so much per dozen or per hundred. They are slimy and disgusting looking creatures, as they crawl about over one another on the market tables.

Snails in a French market.

The edible snail comes chiefly from the vineyards of Switzerland and southern France. It is fed in gardens made

for the purpose, and the fatter it is, the higher the price it brings. The best snail food is cabbage and clover, and it is said that a wagon load of cabbages forms a single meal for one hundred thousand snails. In some places the snail farmers keep their stock in the house during the winter, and they know just how to handle the eggs and the baby snails and how to fatten the full grown snails for the market. The most of the product of these farms goes to the French cities, although several hundred thousand pounds of snails are annually sent to the United States.

24. VEGETABLES

ACCORDING to investigations made by our Government Department of Agriculture, vegetables form more than one fourth of the daily food of the ordinary American family. They are eaten everywhere in large quantities, and there are few peoples so savage that they do not raise some kinds of them.

The different plants and parts of plants thus used are so many that we cannot mention them all. Some plants are valuable for their roots, as turnips, carrots, and beets; some for their bulbs, as onions and garlic; some for their tubers, as potatoes; others for their stems, as asparagus and celery; others for their leaves, as cabbages, lettuce, and spinach; others for their seeds, as peas and beans; and others for their fruits, green and ripe, as cucumbers, squashes, tomatoes, and melons.

Some vegetables will grow well only in certain localities

and in certain climates, and some are found almost everywhere. In the United States the principal varieties thrive, during one season or other, all over our country; and outside the cities almost every family grows its own vegetables.

We have also many thousand farms and gardens where vegetables are raised for the markets, the product being

A truck farm.

so great that it sells for several hundred million dollars every year. The best soil close to our large cities is used for gardening; and along our southern Atlantic Coast vast quantities of vegetables are raised during the winter, spring, and early summer, for shipment to our northern cities, where the weather is so cold that vegetables cannot be produced at such times. This business is called trucking or truck farming.

One of the chief trucking centers of the United States is the lower shore of the Chesapeake Bay, whence vegetables are sent upon fast steamers to our chief northern Atlantic ports and also to Richmond, Baltimore, and Washington. During the height of the season several great ships loaded with garden truck steam daily from Norfolk for New York and Boston; and vegetables are also carried in refrigerator cars to the larger cities of the interior.

A little farther south, in North Carolina, is another trucking region, the chief port of which is Wilmington; and still

Shipping watermelons.

farther down the coast, quantities of garden stuff are shipped from the ports of South Carolina, Georgia, and Florida. Among the chief products of eastern Georgia is the watermelon, which is sent northward, beginning in early July, and which reaches nearly every large market east of the Mississippi River. About one half of all the watermelons used

in the United States come from eastern Georgia, although Norfolk sometimes ships as many as six hundred thousand in one year.

Trucking is usually done upon small farms. A large amount of vegetables can be raised upon an acre; but the crop requires careful cultivation and almost constant attention. The plants must be weeded and hoed and the insects

Picking tomatoes on a southern truck farm.

and worms destroyed, so that one man cannot take charge of a large tract. The ordinary truck farm usually contains only ten or fifteen acres; and we have in our country something like two hundred and fifty thousand market gardens of the average size of one acre each. From many of these gardens the products are taken direct to the cities near by, and sometimes the gardener hauls the vegetables into town in his own wagon and peddles them out.

A great deal of trucking is done on the Pacific Coast, where it is carried on by Chinese and Italians. The Chinese are skillful cultivators. They economize every inch of ground and do not spare water, fertilizer, or trouble, in growing their crops.

Not many years ago canned vegetables were almost unknown. They were costly and were used chiefly upon shipboard or in remote places where other food was not obtainable. To-day they are sold in all our grocery stores, as well as at the mines, lumber camps, and other out-of-the-way places. We now have more than two thousand establishments devoted to canning; and about four fifths of them are engaged in putting up fruits and vegetables. The business employs a capital of over fifty million dollars, and at certain times of the year the labor of something like one hundred thousand men, women, and children.

The vegetables most canned are corn and tomatoes, our product of these two articles alone amounting to something like thirty million pounds every year. Peas are preserved in a green state, and likewise asparagus, lima beans, string beans, succotash, beets, cabbages, pumpkins, and squashes. Indeed, it is now possible to buy almost any kind of vegetable in cans.

Until a short while ago, the only way of keeping fruit and other such things was by drying, or putting them away in salt or sugar. It was in 1795 that Nicholas Appert, a Frenchman, submitted to his government a plan for preserving food by heating it in glass jars set in boiling water, and sealing the jars while hot. This plan worked so well that the emperor, Napoleon Bonaparte, paid Appert twelve thousand francs for his invention. The discovery was

introduced into England, and in time a canning business grew up in that country. Shortly afterward other inventions were made along the same line; and about 1815 Ezra Daggett brought to the United States a process for canning salmon, lobsters, and oysters, which was extended to the preservation of pickles, jellies, and sauces, and thus formed the basis of quite an industry.

When men began to put up vegetables, tin cans were found to be cheaper and more easily shipped than glass jars; and, as the business grew, many machines were invented to prepare the vegetables for cooking and to aid in canning them. We now have hulling machines which will take green peas out of the pods at the rate of a thousand bushels per day; and separators which will grade the peas; sieves for sorting and pea blanchers for scalding them. There are corncutters which take the grains from the cobs of four thousand ears in one hour; and corn silking machines which remove the silk at an equal speed. There are also machines for preparing tomatoes, pumpkins, and squashes, and many kinds of graters, corers, and seeders.

In canning vegetables and fruits, galvanized wire baskets are now used to lower the articles into the scalding kettles; and there is an automatic machine which will fill twelve thousand cans in a day. Some vegetables are cooked in the cans. A great number of cans with soldered tops are placed on a tray, and all are lowered into a cooking boiler at one time, a little hole being left in the top of each can to permit the air and steam to escape. When the cooking is finished, the tray is raised, and a drop of solder, placed upon the hole, seals each can tight.

25. POTATOES

POTATOES form such an important part of our daily food that it is hard to imagine living without them. Nevertheless, the Egyptians, Greeks, and Romans of the olden time never heard of them, and although Shakespeare in his "Merry Wives of Windsor" makes Falstaff say "Let the sky rain potatoes," it was long after his time that they became a common food of civilized man.

Potatoes existed nowhere but upon this hemisphere until some years after Columbus discovered the New World. The Spaniards found the Indians eating these vegetables in the valleys and on the slopes of the Andes, and the potatoes which they carried home with them were the first ones seen in Europe. They were shown to Queen Isabella, and were first grown as curiosities in flower gardens. Later, some were taken to Virginia by the Spaniards, and from Virginia to Ireland by Sir John Hawkins. Sir Walter Raleigh is said to have carried the first specimens from Ireland to England and showed them to Queen Elizabeth, advocating their use as food.

It was many years, however, before the people of Europe began to appreciate this vegetable. They used it first for their cattle and hogs and then for the poor in times of famine. It was chiefly as a famine food that the potato was first cultivated in Ireland; but the better classes soon discovered its value, and it then became one of the chief crops of that country and also spread to many parts of Europe. The early use of the potato by the Irish gave it the name of the "Irish potato," in contrast with the

sweet potato, which is also a native of our hemisphere. We shall treat of the sweet potato further on, using the general term "potato" for the Irish potato only.

To-day potatoes are used in every country of Europe, and more are raised there than in any other part of the world. The chief of all potato lands is Germany, which yields about one fourth of the world's crop. The sandy plains

Plowing a potato field.

sloping up from the Baltic are especially adapted to these vegetables, and they produce many million tons of them every year. Other European countries which raise potatoes in large quantities are Russia, Spain, Portugal, Austria-Hungary, and France. In the United States the potato crop ranks next to our cereal crop. We raise several hundred million bushels annually, and there are few farmers who have not their potato patches.

Our chief potato states are New York, Wisconsin, Michigan, and Pennsylvania, although we have many others which raise this crop in large quantities. Some of the best of our potatoes are produced in California and Utah and upon other parts of the Rocky Mountain plateau.

Have you ever considered what an odd vegetable the potato is? It is a tuber which grows under the ground on the roots of a plant, instead of upon its vines or branches. The French call it *pomme de terre*, which means "apple of the earth," and the Germans also know it as the earth apple or *der Erdapfel*. It is not unlike the apple in size; and contains an enormous amount of water, as does the apple, but, in addition, it has a considerable amount of starch and of other elements, which make it much more valuable for food.

Potatoes are grown by planting old potatoes or pieces of them. Upon each potato are numerous little buds, called eyes, from which, when planted, the vines grow up and the roots grow down. After a while little potatoes form on the roots. They grow to the size of peas, then of marbles, and some varieties finally become so large that one potato weighs several pounds. At the same time the vines have grown above ground until they have reached a height of two or three feet. Their color is a rich dark green, and they have beautiful little flowers and now and then round purplish seed balls. When the vines begin to die, the potatoes are ripe, and they may then be dug or plowed up and stored away or sent to the market.

There are many varieties of potatoes, some early and some late, some large and some small. Some have a

better flavor than others, and some will produce far more to the acre. It has been found that when one plants the seeds in the little potato pods, new varieties may come from them; and that when these potatoes themselves are planted, they produce their own kind. The famous Early Rose potato came from the seeds of some South American

Harvesting potatoes.

wild potatoes, which had been carried to Vermont and planted; and the Burbank potato was discovered by a schoolboy named Luther Burbank, who planted some seeds from the vine of an Early Rose. Young Burbank had heard how the Early Rose potato originated. He was interested in plant growing and when, upon going to school one morning, he saw a green seed pod in an Early

Rose potato patch by the roadside, he decided to gather it when ripe and to save the seeds to plant the next year. He looked further, but this pod was the only one he could find. The Early Rose differs from many other varieties of potatoes in that it does not often have seeds; therefore young Burbank was especially anxious about this pod. He watched it carefully from day to day, and the very morning when he thought it would be ready for picking, he was dismayed to find it had disappeared. He looked for it a long time and finally got down on his knees and went carefully over the bed. After some hours he found the pod. It lay hidden away under another vine about sixteen feet distant, where it had been blown by the wind, or thrown by some one running rapidly through the field. He saved it and planted the seeds the following year; and the result was the Burbank potato, which is now famous throughout the world.

I have visited some of the high valleys of the Andes Mountains, which are said to be the home of the potato, and have watched the Indians selling potatoes in the Peruvian and Bolivian cities. Many kinds are sold in La Paz, where the market women peddle them out at so much per pile of a dozen or so. The chief varieties there are by no means so large as those of the United States, some kinds being little larger than marbles.

During the winter we keep potatoes in cellars or in other warm places. The Bolivian Indians accomplish the same object by freezing and drying them. They soak the potatoes in water and let them freeze night after night until they are soft. The skins are then rubbed off by treading them with the bare feet, and the potatoes are

dried in the open air. After so drying, they become as hard as stones, and they have to be soaked three or four days before they are cooked. They are now called *chuno*, and will keep a long time.

Irish potatoes are used for making starch, glucose, and other things. The Germans make alcohol of them and feed them largely to their cattle and hogs.

Next to the Irish potato, the vegetable most extensively grown in the United States is the sweet potato. It is annually raised by more than one million farmers, and the crop sometimes sells for over twenty million dollars. It is cultivated most largely in our Southern States, and also to a considerable extent in New Jersey, Illinois, and Missouri. The crop grows best in a warm, sandy soil, where several hundred bushels are frequently gathered from one acre.

26. IMPORTANT VEGETABLES USED FOR FOOD

IF our vegetables could speak and tell us about themselves, we might learn that each has its history, and that many have long held an important place in furnishing food for mankind. Even the humble bean might show us that it requires some education to know him. He could tell how his kind originated in western Asia, and how he has for ages been used as food throughout the world. He might say that there are one hundred and fifty varieties of him now cultivated in the United States; and refer to the string bean, which we eat green, the lima bean, whose

native home is South America, the bone bean, which came from Scotland, and the soy bean, used in China and in Japan for making a sauce and also for the delicious bean candy which all Japanese boys and girls like. He would surely mention dwarf beans, field beans, bush beans, and pole beans; and, if he were properly asked, he might tell us just what kind of a bean it was up whose mighty stalk Jack the Giant Killer climbed.

The bean would certainly say something of himself as food for cattle and hogs; and he would not omit to tell how the famous baked beans of Boston are cooked and exported everywhere in cans. Indeed, he might even go back into history and describe the elections of ancient Greece, when beans were used by the voters as ballots, each man dropping one into a helmet to indicate his choice; or, he might tell about the feast of the Bean King, which was long held on Twelfth Night in France, Germany, and England. At this feast a bean was hidden in a large cake, and when it was cut, the child who got the slice containing it was made king over the rest of the guests for that evening.

The pea would also have his story, showing how he first grew wild in southern Europe and in Asia, and was a common food of the ancient Greeks and Romans. He might say that he formed a principal food of the working classes in England before the potato was brought over from America; and tell how he is now eaten, both green and ripe, throughout the civilized world.

As to the cabbage, which is supposed to be the dullest of all the vegetables, his head is full of strange information. The Romans and Greeks had a tradition that he sprang

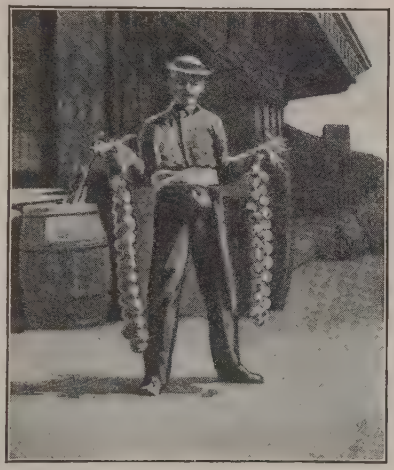
from the sweat of Jupiter, some drops of which fell upon earth. We know that cabbages have long been cultivated, that our common cabbage was first brought into England by the Romans, and that it is now grown everywhere in the United States. There are all together more than an hundred different varieties of cabbages; some are red, and some white, some are small and some are large, a single head weighing thirty pounds, and, with the leaves, being big enough to fill a wheelbarrow.

The lettuce, another leaf vegetable, comes from the East Indies; but it has been used in salads in Europe as far back as any one can remember. We raise a great deal of it in Michigan and New Jersey. It is grown largely in the south during the winter, and is shipped northward in barrels and crates. Cabbages and spinach are exported in the same way.

But how about the plants whose roots and bulbs are so largely eaten? I refer to beets, carrots, onions, and turnips. For hundreds and hundreds of years each of these vegetables has been a part of the food of man. We have all heard of the Pyramids of Egypt. Herodotus, a Greek historian, sometimes called the Father of History, who wrote about them ages ago, says that the writings carved upon them showed how much garlic and how many radishes and onions were eaten by the workmen during their building, and that the cost of these vegetables alone amounted to sixteen hundred talents of silver, or a great deal more than one million dollars.

We know that man has been eating onions and garlic from that time to this. The Spaniards and Italians are especially fond of them, and the onion peddler is a common

sight in the cities of southern Europe. He puts up his onions in strings by braiding together the tops and goes about with them thrown over his shoulder.



A Spanish onion peddler.

As to carrots and turnips, they are a choice food for cattle as well as for man; and beets are eaten by both man and beast. Indeed, some of us eat beets every day in a way we little imagine. We spread them upon bread and butter in the form of beet sugar; and we are often consuming beets when we eat candy. We shall learn more about this later on, when we look into the beet sugar product of the world.

The story of asparagus, the vegetable which comes first upon our tables in the early spring, is interesting. It was used in old Rome, and the Roman soldiers carried the knowledge of it to the Gauls and Britons. It grew wild in Holland, France, Germany, Hungary, and England, and soon it began to be cultivated in the gardens. It was brought to our country by our Pilgrim Fathers and is now grown everywhere. All along our Atlantic Coast, from Charleston to Boston, and on the Pacific Coast, and in parts of the Mississippi Valley, asparagus is raised for shipment to the markets, great quantities being produced on Long Island and in New Jersey.

Asparagus belongs to the lily family of plants, and it might be called a second cousin to the smilax whose vines are used for floral decorations. It can be grown from the seed; and a bed once started will produce for years, new shoots coming up every season. Only the shoots are eaten; they are round fat green or white

Preparing celery for the markets.

stems which sprout out of the center of the plant and are cut when soft and tender. They are tied up in bunches of ten or more to be shipped to the markets.

Celery is a native of Europe, but it is now cultivated widely in our country, especially in Michigan, Ohio, and New York, and also, for winter use, in Florida and California. So much celery is grown about Kalamazoo,

Michigan, that it is sometimes called "the celery city." The celery is raised there on the rich lowlands about the town. The seed for the earliest celery is sown in hotbeds before the snow has disappeared, and the plants are set out five or six weeks later, being banked up from time to time to keep the sun off the stalks and thus produce the white color.

Some of the celery land is so low and wet that wooden plates about as big as a large geography book are fastened to the shoes of the horses to keep them from sinking in, while plowing the rows. The horse soon learns to shift his feet sideways, so that he does not step on his wooden shoes. Similar shoes are used on plow mules, on some of our truck farms in the lower part of Florida.

But it would take a long time to discuss all the food plants grown in our gardens. If you would know more about spinach, cucumbers, squashes, pumpkins, and a host of such things, you must ask each plant for its story. We can now take a glance at only the tomato and the melon. The tomato is such an important food product that it is canned in greater quantities than any other vegetable. It is now grown in almost every garden, but civilized man knew nothing about it until the New World was discovered; and long after that it was cultivated only for the beauty of its rich green foliage and its fruit, which was thought to be poisonous. It was called the love apple.

The muskmelon came from the warmer regions of Asia, and it is now grown in all parts of the world where it is not too cold. The cantaloupe, one of the smallest varieties of this vegetable, is especially delicious. The watermelon is a native of tropical Africa, but it is now eaten

Packing cantaloupes.

almost everywhere. We have two hundred thousand acres devoted to it in the United States, and in the early summer it is shipped from our Southern States to all parts of the north.

27. IN THE GARDENS OF OTHER LANDS

LEAVING the United States, we shall now take a flying trip to learn something about the vegetables of other parts of the world. Europe has extensive gardens. Its chief cities are surrounded by them, and the best soil of the thickly populated regions is used for growing vegetables. In the winter many varieties of garden stuff are produced

in glass houses and hotbeds; and the warm countries of the south supply the people farther north with their winter food of this kind. Fast trains are always shooting from one end of Europe to the other, carrying vegetables and fruits; and many vegetables raised under the hot winter sun of Algeria are sent on steamers across the Mediterranean to France, and thence by rail to Paris and other cities. On the southern side of the English Channel are large gardens and truck farms whose market is London; so that commerce and transportation have a great business in bringing the vegetables from the places where they are raised to the people who, for reasons of climate, soil, or business, cannot produce them themselves.

This is so not only in Europe and in our own country, but in all parts of the world. Steamers and railroad trains are always moving up and down the earth, transporting food products that can be grown to better advantage in one section than in another. China sends vegetables and fruits to Japan, and Japan sends foods back in return. I once traveled from Swatow, in southern China, to Bangkok, *via* Hong Kong, on a steamer loaded with cabbages and potatoes for the Siamese; and, in going down the east coast of Australia, our vessel took on tropical fruits and early vegetables at the northern Queensland ports, which are nearer the Equator, to sell in Sydney, Melbourne, and Adelaide, the colder cities of the south. In sailing up the Parana River from Buenos Ayres northward to Asuncion in Paraguay, we carried vegetables; and returning, our ship was filled with oranges and tropical fruits. One who goes in the early spring from Havana, or other parts of the West Indies, to New York, may see ripe tomatoes, early potatoes,

eggplants, and other fresh vegetables placed upon board for our markets.

Down the west coast of South America extends a narrow strip of desert, about two thousand miles long. It has rich mines here and there; and near the coast of northern Chile are nitrate fields which supply fertilizing salts, so good for raising vegetables that the gardeners of our country and Europe pay high prices for them. For that reason, they are exported by the ship load. A great industry has been established in digging the nitrate rock from the desert, and cities and towns have grown up there. Nevertheless, the climate is such that no vegetables or fruits can be raised there. No grass and green trees are to be found anywhere, and the people must depend entirely for their garden stuff, fruits, and other food, upon the lands which lie far to the north or south of them. So, although the nitrate region yields the very best of stuff to raise vegetables, it is entirely dependent on other lands for its vegetables. Commerce, however, enables it to sell its nitrate rock to the market gardeners across the oceans for enough to supply it with all the food it needs, and a large sum in addition.

The miners of the desert likewise exchange their gold, copper, and silver for food, in another way; and so do the workers in factories, in cities, or in the bleak and out-of-the-way places of the earth. Indeed, every populated part of the globe has, or is able to make, some things much desired by man, that other lands have not; and hence, the whole world is joined together by human wants and the money paid to supply them.

There are, however, some foods which grow in certain

parts of the earth which are almost unknown and unused in other parts. We have seen how Indian corn, potatoes, and tomatoes were strangers to our race until Columbus discovered the New World. Millions of people are to-day feeding upon things that seldom come upon our tables and of which we know little. One of these foods is manioc, the roots of which, in South America, the West Indies, and in parts of Asia and Africa, largely take the place of both potatoes and wheat. The South Americans eat them roasted, boiled, and baked, as we eat potatoes, and also grind them into flour, from which bread and cakes are made. In the Congo Valley the manioc root is mashed to a pulp, and after being washed is allowed to ferment. It is then mixed into a stiff dough and cooked up like dumplings, to be eaten at home or sold in the market. We use manioc ourselves in the shape of arrowroot and tapioca, and we grow it to some extent in Florida and on a narrow strip of land along the Gulf of Mexico, from that state to Texas.

A load of manioc.

Manioc, or cassava, belongs to the same family as the milkweed. It is not raised from the seed, but from the canes or stalks of the previous season, which are kept and planted in much the same way that sugar cane is. Both root and cane sprout out from the joints, the cane growing to a height of four or five feet, and the roots extending

out on all sides in a cluster which sometimes weighs many pounds. A single root is often as big around as one's wrist and as long as one's arm. The roots are the valuable parts of the plant. They are full of starch and other food matter, and in some varieties they contain also

In a tapioca factory at Singapore.

a bitter acid, which is poisonous. This is removed by washing or cooking, after which they form an excellent food.

In making tapioca the bitter roots are washed and then cut and ground up and mashed to a pulp. They are next strained in such a way that all the starchy particles are taken out of the fibers. The starch is then allowed to settle and harden, when it is broken fine and packed for

shipment abroad. There are tapioca factories in the West Indies, at Singapore, and in other parts of Malaysia, and also at different places in South America. We use tapioca in puddings and soups. It may be found for sale in almost any grocery store. In some parts of the world manioc roots are fed to cattle and hogs.

Our cousins of the Hawaiian Islands have a vegetable which furnishes such a large part of their food that they could not afford to lose it. This is the taro plant, which grows almost everywhere in the warm islands of the South Seas. It has no stem; but its heart-shaped leaves are so large that one would almost do for an umbrella. The leaves and stalks are sometimes eaten like spinach and asparagus; but the chief food value lies in the long tuberous root, which is full of starchy material.

Taro plant.

Taro is grown in gardens, or in patches out in the fields, by planting cuttings from the tops of the roots. When ripe, the roots are dug up, washed, and then roasted or baked. They are next put into wooden trays and pounded up with water into a thick dough, which is allowed to ferment. This dough is called *poi*, and it may be eaten as it is, or cooked again in a variety of ways. In the Himalaya Mountains and also in Japan and Porto Rico, somewhat

similar roots are used in the same way that we use potatoes.

The bamboo, from one variety of which we make fishing poles, takes the place of asparagus in tropical countries. It grows in clumps of tall cane, which are often large around at the base and as high as a three, four, or five-story house. This plant sends out shoots, so tender that they can be eaten boiled or stewed, or can be pickled with vinegar and other sauces. Bamboo shoots are esteemed delicious by the Japanese, Chinese, and also by our cousins of the Philippine Islands. The Chinese consider one species of this plant an emblem of a child's obedience to its parents, which they regard as the greatest of all virtues. They have a legend about a Chinese boy who so loved his mother that, during one winter, when she was sick and longed for a soup made of bamboo shoots, he went out to the garden and watered the bamboo plants with his tears. As the story goes, his tears were so hot with his affection, and so copious, that they softened the frozen soil and caused the tender shoots to burst forth. I will not vouch for the truth of this story, but it may be found in Chinese books; and it is said that the Japanese have named a bamboo after the Chinese boy who so loved his sick mother.

Bamboo grove.

28. ODD FOODS FROM TREES AND VINES

THERE are many other foods from trees and vines. The crowns of many palm trees from which the long leaves sprout out are cooked as we cook cabbage, and eaten; and there are several palms the sap of which is used to make wine and sugar. The sap of the nipa palm of our Philippine Islands is made into palm wine and palm beer; and there are palms known as wine palms and cabbage palms. The carnauba palm of Brazil has not only an edible crown, but its leaves are coated with a vegetable wax from which candles are made; and the nuts of the betel palm are chewed like tobacco in the Philippine Islands and the neighboring countries. The doum palm of Upper Egypt is often called the gingerbread tree, because its fruit is brown and mealy, tasting somewhat like gingerbread; and the sago palm has a pith which is made into meal or flour and sent all over the world, to be used for making starch and confectionery, and in puddings and the thickening of soups. We can find some of this pith in almost any of our grocery stores.

The gingerbread tree.

The sago palm is the most important of all the food palms, with the exception of the cocoanut palm. It is grown for commercial purposes in southeastern Asia, especially in Singapore, Sumatra, and the neighboring islands. It is not as tall as many other palms; but it is so thick that a full-grown man could hardly reach around it.

The trunk of this tree consists of a hard wall, inside of which is a spongy pith, so full of starch and other nutri-

Making sago.

tious matter that it gives a great quantity of excellent food. It is said that three large sago palms will yield more food than one acre of wheat, and several times as much as an acre of potatoes.

There is just one time in the life of this palm when it is fit for eating. This is when it is about seven years old, just before it begins to bear fruit. After that, the pith

gradually disappears, and when the tree is full-grown the trunk becomes a hollow shell.

In making sago the palms are cut down near the roots, and the trunks are divided into logs six or seven feet long. These are split, and the pith is taken out and ground to a powder somewhat like sawdust. The dust is next mixed with water and then run through a series of sieves, to get out the coarse fiber. During this process the starchy and food materials go into the water, which is drawn off into other vessels. As it stands, the sago falls to the bottom in a flour or meal and later is dried and roasted in such a way that it forms the pearl sago of commerce. Sago meal is eaten by the natives as a mush, and is also baked in small biscuits, in which shape it will keep a long time. The island of Singapore is one of the chief places where pearl sago is made.

Have you ever thought how the peanut gets its name? It is really a ground pea with the taste of a nut. It has a pod somewhat like a pea, but the pods or shells grow on the stem of the plant under the ground. It seems strange to speak of the peanut as a vegetable; but if we should go to the southern part of Virginia, we might see great fields of them being cultivated by very similar methods to those used in cultivating potatoes or corn. Peanuts are raised there for export, and millions of bushels are shipped away every year.

The peanut grows in many tropical and subtropical countries. It is thought to be a native of Brazil, but it is now grown in all the warm regions of the globe. Great quantities are raised in Africa, Europe, and in Virginia, North Carolina, Georgia, and Tennessee. We use pea-

nuts chiefly for eating at odd times, rather than as a staple article of diet. They are on sale in our stores, and men and boys peddle them about at fairs, shows, and at the fruit stands in our various cities. We eat them in candies and in peanut butter; and we also feed them to hogs and to cattle. In Europe peanuts are imported from Africa and

Peanut pickers in North Carolina.

elsewhere for making an oil, much like salad oil; and amongst some African tribes they are an important food.

In planting the nuts are first shelled and then dropped in hills or drilled in rows. They soon sprout and grow vines which cover the ground and look somewhat like clover. They are carefully plowed and hoed to keep down the weeds. When the vines are about eight inches long they begin to blossom and are soon covered with

small yellow flowers. As each flower fades away, a sharp pointed stem shoots out, turns downward, and buries itself in the ground. On the end of the stem a pod forms, containing the peanuts, which continue to grow until they are ripe.

The planting is done in the spring, and the nuts are ready to harvest in the fall. The vines, with the peanuts attached to their underground stems, are dug up and put in little stacks about poles to dry. They remain in the stacks several weeks, after which the nuts are picked off and sacked up for the markets. A thrifty peanut vine should yield about one hundred nuts, and an acre forty bushels.

After the peanuts are picked from the vines, they are still covered with dirt and must be cleaned before they can be sold. The cleaning is done in fanning mills, much like those used by farmers for cleaning grain. After this process the nuts are sorted by women and girls, who pick out the bad ones, as the peanuts are carried by them on a moving belt a yard wide.

29. GENERAL VIEW OF OUR FRUIT INDUSTRY

NOT many years ago fruit was much less important as an article of commerce than it is now. Only a few fresh fruits, such as apples, lemons, and oranges, could then be kept for a long time or be sent to any great distance from the places where they were grown; and only a few dried fruits, such as dates, raisins, and prunes, could be exported.

Modern invention has since supplied quick transportation on land and sea and also cold storage arrangements, by which fruits can be preserved fresh during their transit from one part of the world to another. America, Australia, and South Africa now ship apples, pears, and plums to Europe; and Europe sends back dried figs, raisins, and seedless grapes in return. California exports oranges, lemons, peaches, and pears to New York, Chicago, and other cities; and Washington and Oregon give our Eastern States some of their most delicious apples. Florida sends subtropical fruits to the north, and Georgia gives us peaches long before they are ripe in the Northern States.

Later in the year, after the fruit season in some localities is over, the southern people import fruit which has ripened more slowly in the cold north lands. Indeed, commerce now supplies us with fresh apples, lemons, bananas, and oranges throughout the year; and pears, strawberries, grapes, and peaches, which a half century or more ago could be had for but a few weeks, are now brought from so many different climates that they are in our markets for many months.

Inventions for preserving fruits have also been made. They are so dried and canned that they can be kept a long time and shipped all over the world. Fruits, fresh and preserved, now form a large part of the diet of civilized man.

When our continent was discovered, the Indians had only a few species of wild grapes, plums, and berries, and these were worth but little. Now we have almost every fruit of the north temperate zone, many of the south temperate, and even some of the tropical zone. Orange trees

were planted by the Spaniards at St. Augustine, Florida, more than half a century before the Pilgrims landed on Plymouth Rock. Grapes were growing at Jamestown in 1619, and pears were planted in New York City eleven years later. We know that we had apple orchards about the same time; and, about a hundred years later, one of the villages near Boston reported the manufacture of ten thousand barrels of cider.

Fruits of many kinds were introduced with the settling of our country, and all the world has been called upon for our fruit trees and plants. Europe gave us apples, cherries, and pears; Asia peaches and plums, as well as oranges and figs; Africa has supplied the date which we are now raising on some of the semi-arid lands of the west; and from South America came the navel orange, so important to commerce.

We are now raising more kinds of fruit than any other nation, and we lead the world in the value of our fruit product and in the best methods of fruit preservation and marketing. When our last census was taken, our fruit crop was estimated at twelve billion pounds, and its value at more than one hundred and thirty million dollars, an amount much greater than all the gold and silver mined in our country during that year.

Our fruit crop is so large that the labor of many thousands is required to handle it; and it is so important in some localities, where the soil and climate are exactly suited to raising certain kinds of fruits, that the people do little else but attend to it. The county of Santa Clara in California, for instance, sometimes raises three million dollars' worth of fruit in one year; and Fresno County, in the same

state, produces so many grapes that one year's crop will sometimes sell for about two million dollars. There are regions in New York, Pennsylvania, Ohio, Virginia, Missouri, Oregon, and Washington where apples grow so well that the people have large orchards of them; and California and Florida have an enormous industry in growing oranges for shipment to all parts of our country.

If we could look over the United States and examine each locality carefully, we should find that the larger share

A California fruit ranch.

of the money from our fruit crop comes from the North Atlantic and the North Central States; although the Western States annually produce only a few million dollars' worth of fruit less than either of these divisions. Our seven chief fruit states are California, New York, Pennsylvania, Ohio, Michigan, Illinois and Indiana. Missouri, New Jersey, and Virginia are also important. California produces more than any other state, its product being almost twice as valuable as that of New York, which ranks next, and nearly three times as valuable as that of Pennsylvania,

the third of our fruit states in rank. In one year California has realized fifteen million dollars from its fruit orchards, as well as six million dollars from grapes, and more than seven millions from oranges and other subtropical fruits. In the same year New York realized ten million dollars from its orchards, about three millions from grapes, and about two and one half millions from small fruits. When we remember how thickly New York is populated, how many cities it has, and the great size of New York City, we can see why so much money is realized from small fruits.

30. APPLES

FRUIT trees of one kind or another are to be found in almost every part of the United States, and in some places in such large numbers that the business of caring for them and of marketing the crop is the principal industry. Our apples, quinces, pears, peaches, and plums annually sell for enough to give every man, woman, and child in our whole country one dollar and leave some money over. They bring in about twice as much as the grapes and small fruits, and almost ten times as much as our oranges, lemons, and other productions of a subtropical nature.

Of these products the apple is the most important. It will keep longer than any of the others, and people like it the year round. It is one of the oldest fruits known. Many suppose that the apple was the forbidden fruit of the Garden of Eden and that our first parents were cast out of Paradise for eating it. The ancient Greeks consid-

ered it the most beautiful of all fruits; and it is mentioned frequently in their legends of gods and heroes.

We remember the story of the golden apple which brought about the ten years' siege of Troy and its final destruction by the Greeks. The Goddess of Discord threw the apple which bore the words, "For the Fairest," into a party of gods and goddesses. When it fell, Juno, the wife of Jupiter and queen of all the gods; Minerva, the Goddess of Wisdom; and Venus, the Goddess of Love and Beauty, each claimed that she was the fairest and ought to have it. Jupiter was called in to settle the dispute, and he gave the decision over to Paris, a shepherd on Mount Ida. Each goddess tried to influence Paris by bribes. Juno offered him power and riches, Minerva wisdom, and Venus, the most beautiful woman of all the world for his wife. He gave the apple to Venus, and in return received Helena, the wife of Menelaus, king of Sparta, and carried her to Troy. To get back his wife, Menelaus then raised an army, and with his brother kings of Greece began the Trojan War, which is celebrated in the poems of Homer and Virgil.

And then there is the story of the three golden apples of the Garden of Hesperides, which were defended by a horrid sleepless dragon with one hundred heads, and of how Hercules succeeded in getting them; and also that of the fair maiden Atalanta, who could run faster than any one else in the world. Atalanta was so beautiful and so charming that many a young man wanted her for his wife, but she said she would marry only him who could distance her on the race track; and as she did not want to be troubled with too many suitors, she also said that every one who ran

with her and failed should suffer death. At last the cunning Hippomenes came to try his fate. He brought three golden apples with him, and as he ran he dropped one from time to time. Atalanta could not resist stopping to pick up the apples, and Hippomenes came out victorious.

Apples are now grown in most countries of Europe; and they thrive so well in Tasmania and in New Zealand that they are exported from these countries to San Francisco and London. They are grown more generally, however, in North America than in any other continent, and more generally in the United States than anywhere else. The apple was brought here from Europe by our forefathers, who planted orchards almost everywhere they stopped, as they pushed their way westward; so that apples are now raised on a commercial scale from Nova Scotia to North Carolina, and from the Atlantic to the Pacific. They grow especially well in New England, in some parts of Virginia, North Carolina, Missouri, and Arkansas, and in certain valleys of Washington and Oregon. New York, Pennsylvania, Ohio, Indiana, Michigan, Kansas, and Kentucky are also famous apple states, each having millions of apple trees. Albemarle County, Virginia, the Ozark Mountain region of Missouri, the Wenatchee Valley in Washington, and the Hood River Valley in Oregon are celebrated for their large, delicious, and highly colored apples, and the same is true of eastern Canada and of some of the valleys of British Columbia.

I wonder if any of us has ever heard of Johnny Appleseed? He was an odd character who had much to do with starting the first orchards of Pennsylvania and Ohio, which are now two of our chief apple-raising states. Johnny

Appleseed's real name was Jonathan Chapman. He was born in Boston in 1775, and, when a young man, he went to live in western Pennsylvania, which was then almost a wilderness. Johnny somehow got the idea that it was his mission to give apples to the people, and he began to plant apple seeds wherever he could. In 1801 he drove westward into Ohio, carrying a wagon load of apple seeds which he had gathered from the Pennsylvania cider presses. He picked out fertile spots along the streams and planted orchards. Then he went back and got more seeds and planted them. He often carried a bag of seeds on his back, as he marched through the woods from one settler's cabin to another, and gave some to each settler with whom he stopped. Many of the little trees which grew in his wild nurseries he afterward dug up and sold to those who could afford to pay for them; but the poor could have them for nothing, or in exchange for old clothing, meal, or anything he could use.

The wants of Johnny Appleseed were few, and he cared little about money. He lived simply, camping out in the woods, or, if sleeping in a house, occupying the floor. His dress was the cast-off clothing he had taken in exchange for apple trees. In his latter years he thought even this second-hand raiment too luxurious and chose, as his principal garment, an old coffee sack in the bottom and sides of which he cut holes for his head and arms.

This strange man was considered crazy by many of the settlers, and, indeed, some of his actions lead us to think that he may have been so. His work in planting trees, however, was of such value to the people of Ohio that they have since erected monuments to him.

Nearly all our orchard trees are now grown in nurseries, which are to be found in every fruit-raising section. The nurserymen make a business of raising young trees and plants for sale to those who set them out in orchards or gardens. In the nurseries the seeds of the most hardy of each kind of tree are planted in rows. They sprout quickly, and soon make their way through the ground. After a short time they are budded, in order to get the varieties of fruits most desired.

This budding is an interesting process. It is based upon the fact that the bud of any apple or other fruit tree, if cut off with a part of the bark to which it is joined and slipped under the bark of another variety of the same tree, will grow into a branch which will produce fruit of the same kind of tree as that from which the bud came. For instance, if the bud of a Northern Spy be thus set into a Baldwin tree, the branch from that bud will grow Northern Spy apples, and not Baldwins. So the nurserymen set into each little tree, near the ground, one choice bud; and, when that bud sprouts, they cut off all the other branches and make the tree grow from that bud only, knowing that its fruit will be that of the tree from which the bud comes. In this way they can sell trees in large numbers which are sure to produce the same kind of fruit. Millions of trees are thus budded every year, and it is from them that most of our choice fruit comes.

Fruit trees are bought for planting when they are one, two, three, or more years old. The nurserymen put them up in bundles, wrapping the roots with wet moss, if they are to take a long railroad journey, or to wait some time before being planted. In the meantime, the orchard men have

plowed their fields and fitted the ground for the trees. They set them out in rows, fifteen, twenty, and sometimes more feet apart, according to the variety, and carefully cultivate them from year to year.

Apple orchard.

In planting apple trees some orchardists make the distance between the trees thirty-two feet, and some even forty feet, in order that the trees may not interfere with one another when full-grown. The apple tree is comparatively long lived. It begins to produce fruit at from three to ten years of age, according to its variety; and it will continue to yield if properly cared for thirty or more years.

In our better orchards the trees are carefully watched. They are trimmed every season and are sprayed several times a year with some poisonous liquid which kills the

insects upon them and keeps them free from disease. Each tree is also examined to see that no worms are feeding upon its roots, and the small and imperfect apples are taken off in order to let the strength of the tree go into the best fruit.

The apples are picked by hand in order that they may not be bruised. They are next sorted into sizes and then

Picking apples.

packed up in boxes or barrels for the markets. In harvesting some of the choice varieties, each apple is wrapped in tissue paper before being placed in the boxes; and every box is marked with the number of apples it contains, a box holding from seventy to one hundred and twenty-six, according to size. Apples which have fallen on the ground

are bruised and cannot be used for shipping. These are preserved or made into cider.

The most of our apples are consumed at home, although many are sent in cold storage steamers to England and other parts of Europe, to South America, and the West

Packing the apple crop.

Indies, and even across the Pacific Ocean to the Philippines, Hawaii, China, and Japan. We are rapidly increasing the extent of our apple orchards and also the number of localities where apples are commercially grown. Of all the orchards of the United States more than one half are devoted to apples and we now have more than two hundred million trees. The states having the greatest number of apple trees are Missouri, Ohio, Illinois, Pennsylvania, Michigan, Kansas, Kentucky, Indiana, and Virginia.

31. PEACHES

CHINA is the home of the peach. It came by way of Persia to Europe, and thence to the United States.

The Chinese peaches, however, are by no means so fine to-day as are the American peaches, nor are they grown in such quantities. Persian peaches are now unknown to commerce, and the peach crop of Europe cannot compare in value and in character with ours. The climate of northern Europe is such that fine peaches cannot well be grown there out of doors. Peach orchards are few, and the trees must either be trained against garden walls, facing the sun, or be cultivated in hothouses under glass.

Even in our own country, until a generation or so ago, the peach crop was of no great importance. Until that time all our peaches came from New Jersey, Maryland, and the eastern shores of Lake Michigan; and the peach-eating season lasted only from the middle of August until the latter part of September. Now we have three hundred different varieties of peaches, and they are grown all over the United States, excepting in Maine, Vermont, and the cold regions of the northwest beyond the Great Lakes. We have ripe peaches in our markets from May until November. It has been found that peaches will grow almost everywhere, and that the Southern States will produce them before they are ripe farther north. There are sections of the north that will grow late fruit; and all together the several crops ripen at such widely different times that, by means of refrigerator or iced cars, we can have peaches

all over the country for four or five times as long a season as in the past.

Georgia, Colorado, Missouri, Kansas, Texas, and California are each producing more peaches than were raised half a century ago in our so-called peach belt; and Connecticut, which was then considered too cold for peaches, now yields more than Delaware. When our census officials made their last count of Uncle Sam's orchards, he had all together more than one hundred million peach trees, and peach growing had become a great industry, employing many thousand people and vast sums of money.

The discovery that peaches could be cultivated profitably outside the peach belt above mentioned was largely due to a New England schoolboy whose father had died when he was quite small and who had to work out by the month, during vacations, to make money to help support his mother and to keep down the interest on the mortgage upon their home. One day when the boy was about twelve years old he was cutting corn for a farmer, on a high hill overlooking the beautiful Connecticut Valley, when, right in the midst of the corn, he found a seedling tree loaded down with ripe rosy peaches. He was tired from handling the heavy stalks, and he sat down to rest under the tree, pulling off some of the fruit and eating it. As he munched the delicious peaches, he thought how fine it would be if he could have an orchard full of such trees and could make enough from it not only to pay off the mortgage, but to give him all the money he needed. He then and there resolved to save every cent he could and to buy trees and plant them.

The next year he left school and started his peach or-

chard on the home farm, setting out a few trees at first and planting more and more, as he was able to save the money to buy them. He raised strawberries and other small fruits between the rows of peach trees, to help pay his expenses, until the trees should be three or four years old, and should begin to bear fruit. All this time he was trying to learn where the trees would grow best, produce the most fruit, and be safest from the frosts which often kill the fruit buds. He observed that the best trees in Connecticut were on the sides and tops of the hills; and he tramped around at daylight on the winter mornings, with a thermometer, to learn just which places were the coldest. He found that the temperature would vary from fifteen to twenty degrees below zero on the levels and in the valleys; while, on the hillsides, not more than fifty feet higher, it would be only eight or ten degrees below zero; and on the tops of the hills, three hundred feet above the valleys and perhaps a mile away, only zero. This showed him that the hills were the best places to plant his trees, and it was upon them that he set out his orchards.

All this while the farmers were laughing at him and telling him he was wasting his time trying to grow peaches in Connecticut. The men who had a two thousand dollar mortgage on his home did not approve of his orchards, and they finally told him they could wait for their money only three months longer. In the meanwhile his peach trees had been growing in number and in size. He had now a large orchard in which the fruit was almost ripe; and before the three months were up, he marketed his crop and received more than ten thousand dollars for it. He paid off the mortgage with part of the money and put the rest

of it into more peach trees; and he continued to add to the extent of his orchards until he finally became one of the chief fruit growers of our country and much richer then he had ever hoped to be.

Others in Connecticut who had observed his success then began to set out orchards, and that state is now one of the chief peach-raising regions of our country. This same man afterward went to Georgia and planted peaches there. He had at one time three hundred and fifty thousand trees in his Georgia orchards; and early peaches raised by him were shipped to all the large cities of the north. Since then Georgia has become one of our best fruit states, and its peach trees are now numbered by millions.

If we could visit a big Georgia orchard, we should find that peaches are by no means easy to grow. The trees must be started in nurseries, by planting the peach stones and budding the sprouts, as already described. When they are a year or two old, they are set out, each little tree being first so trimmed that it looks more like a switch than anything else. The trees are planted in rows, fifteen or twenty feet apart. They are carefully cultivated, being trimmed year after year. They are fed with fertilizers, and each tree is examined once or twice every season to see whether a little worm, known as the borer, is not eating away at its roots. Sometimes the trees are washed, to kill the insects upon them, and sometimes they are sprayed, in order to kill horrid little animals, called scales, which, if not destroyed, multiply so rapidly that they eventually ruin the tree, eating away at its bark and sucking the sap.

As the peaches ripen, the imperfect ones are picked off, and the others are thinned, in order that there may be only enough peaches on each tree to produce the largest and finest fruit. In picking peaches great care is taken that they be not bruised. Each picker has a small canvas bag marked with his name and tickets bearing his number.

Peach pickers.

He picks the fruit into the bag and then empties it into a basket, putting first his ticket on the bottom. When the basket is full it is taken to the packing house; and the ticket shows who did the picking. If any bad or bruised peaches are found, an inspector on horseback gallops off and warns the man he is not doing good work.

The peach packing houses are immense sheds filled with

long tables, behind which men and women stand to sort the peaches as they come in. Other hands pack them as they are sorted, and others nail up the crates and put them on the refrigerator cars which take them to the markets all over the country. The refrigerator cars are kept cool by ice and the crates and baskets of peaches are so placed that there is a circulation of cold air about each one during the entire journey. Peaches that are too ripe for shipping are used for canning and drying.

In the smaller orchards the peaches are loaded on wagons and carried to the railroad stations. Along the

Shipping peaches from a small orchard.

shores of Lake Michigan they are taken to Chicago by fast steamers, the greatest diligence being used to get them to the markets in the shortest possible time.

32. APRICOTS, PEARS, QUINCES, CHERRIES, AND PLUMS

APRICOTS and plums, as well as pears, quinces, and cherries, may be found fresh, dried, or canned, in every American market. The apricot resembles both the peach and the plum. The tree is like the plum tree, but the fruit, when ripe, looks more like the peach. It is as hardy as the peach, but, as it blooms early, it is sometimes killed by Jack Frost.

Apricots.

The apricot is supposed to have originated in China. It was carried to Europe by Alexander the Great, and centuries later was brought to America. It grows well in our Pacific Coast States and especially in California, where more than one million bushels are produced annually. The fruit is excellent for drying and canning, in which form it is shipped all over the world.

Pears, cherries, and quinces are also largely preserved. The pear is a native of Europe. It was first brought to the United States about 1630, when a tree was planted near Governor Endicott's house in Boston. It now ranks fourth among our orchard

fruits and is grown commercially in all our states from New England to the Great Lakes, and also in Texas, Michigan, California, Washington, and Oregon, the chief pear-growing states being California, New York, Michigan, and

Sorting cherries for the markets.

Texas. The pear, like the apple, will keep quite a long time; and, like the peach, it is delicious when canned.

The same is true of the quince, which also resembles somewhat both the pear and the apple, but which cannot be eaten until cooked. The quince is the least important of our orchard fruits, and, although it has been cultivated for two thousand years, it has almost no place as an article of commerce.

Cherries are very generally grown in our country. They

are eaten fresh and are also especially valuable for canning and preserving. They are raised in large quantities in Europe and also in Japan and China. The Japanese have certain varieties of cherries which they cultivate only for their flowers. In cherry blossom season they hold picnics under the trees, and the boys and girls, as well as the older people, write verses about nature and tie them to the cherry tree branches.

Far more important than any other of our orchard fruits, excepting the apple and peach, is the plum. It grows well in the United States; and certain varieties, from which prunes are made, thrive to such an extent in California, Idaho, Oregon, and Washington, that we produce many million pounds of dried prunes every year and even export them to other countries.

The plum is a near relative of the peach, but is distinguished from it by the character of its flesh, its smooth skin, and its small, unwrinkled stone. It is a native of many parts of the temperate zone and was found growing in North America when the New World was discovered. It is of many varieties, some of the most peculiar of which are found in Japan and China. At Kowshing, China, for instance, grow delicious plums, each of which has a dimple in one cheek. While there some years ago, my guide told me the story of how this dimple originated. He said: —

"Centuries ago we had here in Kowshing a princess noted for her beauty and gentle ways. She was fond of fruit, and one day, while eating some plums, she picked out an especially fine one and pressed her dainty little finger into it. The pressure left a dimple.

Upon tasting the plum, she found it so delicious that she saved the stone and planted it. This in time grew into a tree which bore plums equally sweet; but each of the new plums, strange to say, had a dimple in its side. The plums were so fine that they became famous throughout China, and buds from that tree were carried everywhere."

There are many widely different varieties of plums. Some are sweet, and some sour, some large, and some small. It is only the large sweet varieties which are used for prunes, and the finest prune plums still come from Europe. France, Germany, Servia, Spain, Austria, and South Africa are all plum-producing regions. France was for a long time the chief plum-growing country of the world. Within the past generation, however, we have begun to produce prunes in our Pacific Coast States, and we now market more than any other one country. There are California valleys which are almost covered with plum orchards; and delicious plums are commercially grown in Oregon, Washington, and Idaho.

In making prunes, the fruit is picked by hand and carefully washed in warm water. All the imperfect plums are taken out and the remainder are sorted according to size. They are next dipped in a mild solution of lye to crack the skin, so that the heat of the sun can penetrate the pulp, and they are then spread out upon long wicker trays or boxes about a yard wide and set in the sun for a week or longer to cure. Several times a day men go about and stir them, rolling them over and over, so that they may be evenly cured on all sides. When thoroughly dried, they are taken back to the packing houses and stored in bins,

until the rush of the picking and curing season is over. After this they are again sorted and graded and packed up in boxes, by machinery and by hand, and shipped to the markets.

In the more fancy varieties, the boxes have glass lids, and the prunes are fitted in, one by one, so carefully that

Plums drying for prunes.

they lie in rows. Many school children are employed in California in picking and curing this fruit. The work can be carried on during vacations, and girls and boys and even students from high schools and universities go out from the cities to aid in the harvest. In some orchards the prunes are dried over a fire, and in certain parts of Europe they are partially cooked before they are dried.

33. GRAPES

WE want to know something about our grape industry. It is more extensive in California than anywhere else in the United States. This state has more than one hundred million vines, and it raises enough grapes in one year to give ten pounds to every man and woman and boy and girl in the United States, including the babies.

The grape is one of the oldest of cultivated plants. The ancients considered it, like the olive, the symbol of civilized life, and the Greeks and Romans paid worship to Bacchus, the God of the Vine. The grape grows wild in the Mediterranean countries of Europe, and also in some parts of Asia. When our forefathers came to America, it was found all along the coasts of our country from Massachusetts to Florida, and the Indians ate grapes, fresh and dried.

The cultivation of grapes dates back to the beginning of history. They were eaten by the early Egyptians and were introduced into England by the Romans. They are now raised in almost every part of Europe; and in France, Italy, and some other countries they form a principal crop. France produces so much wine every year that she could give every inhabitant of the world a gallon and have some left over. Italy makes about half as much wine as France, and Spain half as much as Italy. In our country we raise grapes to eat fresh or as raisins and also for making wine. We do not, however, lead as a wine-growing country; for we are not, as a nation, wine drinkers, and we think it is much better for us that this is the case.

To-day grapes are raised commercially in New York, Ohio, Virginia, Missouri, and in all the Southern States from North Carolina to Texas, and also in California, New Mexico, and Arizona. Many of our grapes, such as the Scuppernong and Catawba, are the descendants of those found growing wild when our forefathers came to

A vineyard in France.

this country, and others, especially those of California, come from the choicest grapevines of Europe.

Our first attempt at grape culture was made in Virginia in 1610 by a Frenchman, who planted a vineyard at Jamestown. About ten years later more Frenchmen came over; and when Thomas Jefferson was President Congress gave a grant of land to some immigrants from

Switzerland who wished to try grape growing in southern Indiana on the Ohio River. These enterprises, however, were not successful; but vineyards set out near Cincinnati some years later did better; and now the grape is cultivated in almost all parts of the United States. We have learned what localities are best fitted for grape raising; and by the use of cold storage and other methods, we are able so to transport and keep grapes that we have them to eat during the greater part of the year.

In order that the grapevine may be successfully grown, it must have plenty of sun, not too much moisture, and an excellent soil. These conditions are just right in California. The state runs north and south through ten degrees of latitude; it has mountains, hills, slopes, rivers, and valleys, giving it such a variety of temperature and of soil that it can raise almost any kind of grapes for eating, for raisins, or for wines.

Grapevines are grown from cuttings. Slips of the ripe wood, cut off in the fall, are buried in the ground until the following spring, when they are planted in nurseries. They soon sprout and a little later they are set out in the vineyards. The vines are carefully cultivated, being trimmed back from year to year. In the eastern parts of the United States they are frequently grown over arbors or on trellises; but in California each vine stands alone, out in the field, often without a stake or anything to support it.

The vines begin to bear at about two years of age, and every year after this they are cut back to the trunk, so that the new branches trail out on all sides on the ground. After a few years' pruning, the trunk grows stout and stubby, like the body of a small oak tree; and it is seldom

more than two or three feet in height, although it may be eight or nine inches thick.

But we shall see this better in the vineyards. Let us suppose that we are in Fresno County, California, where so many grapes are raised that if one year's crop could be distributed over the United States, every one of us might have a handful and a quantity be left over. This is one

In California each vine stands alone.

of our chief raisin-making regions, and we shall be able to see the people drying the grapes and packing them for the market.

The time of our visit is midsummer. How hot it is! The sun shines down like a ball of fire, and the heat waves are dancing above the green vines. The country is flat, and, by climbing to the top of one of the packing houses,

we can see the vines reaching away for miles on each side. The land is almost level. It is cut up by irrigating canals, and white streams are flowing here and there amongst the green leaves. There are two thousand miles of canals in this region, with two or three times as many miles of ditches running out from them to water the grapes.

We come down from the roof of the packing house and walk through one of the vineyards. The vines are about as high as our waists, and their great branches, loaded with bunches of almost transparent white and green grapes, lie upon the ground, so that one might think they would be baked by the sun. Pick up some of the ripe fruit and taste it. How sweet! This variety is known as the White Muscat. It is a large grape, with a soft thin skin and a hard plump pulp, so full of sugar that it is especially good for raisins.

But let us go to the other side of the vineyard and watch the men and boys picking the fruit. Each has a tray about two feet long and three feet wide. He lays the ripe bunches carefully upon this, handling each bunch by its stem in order not to injure the bloom on the grapes nor bruise them, as he transfers them from the vine to the tray. He cuts off the bunches with a sharp curved knife and then snips away any defective berries with a pair of scissors, laying the bunches carefully down. The tray will hold twenty-five pounds of grapes, and these, when dried, will yield just about five pounds of raisins.

When his tray is full, the man carries it to one side and so places it that the full rays of the sun will shine upon it all day long. It is not disturbed for a week or longer; and then the half-dried grapes are turned by

placing an empty tray over the full one and inverting the latter. The trays fit so closely that the grapes may be turned in this way without handling. They are allowed to remain in the sun for a few days longer; then they are taken to the packing house and put into sweat boxes, which

Picking grapes for raisins in California.

even the moisture and give the grapes the aroma that the lover of raisins enjoys almost as much as the taste.

After this sweating process, the grapes are taken out and packed. The bunches are first separated from the loose grapes and then carefully placed in boxes in layers. The bunches that are too small for this purpose are put into a stemming machine, from which they are carried to a series

of sifters; and they are finally sold as crown raisins, the loose raisins we use for cooking.

Leaving this vineyard, we go to others, finding hundreds of men, women, and children gathering grapes. In some places the grapes are of a smaller variety, without seeds, known as Sultanas, from which seedless raisins are made; and in others they are Muskats, grown upon vines which have been brought to California from Chile, where the climate and soil are very similar to the climate and soil of California.

Until within comparatively recent years, all the raisins used in the United States were imported from Europe. They came from the warm countries along the Mediterranean Sea, and especially from southeastern Spain, a region which is noted for the Malaga grape, and which is to-day one of the raisin-producing parts of the world. If we could go there, we would find the grapes cultivated by very similar methods to those used in California. They are allowed to lie on the ground, and are carefully picked. They are not only dried in the sun, as here, but in some places are also cured by steam, the cut grapes being put into baskets and brought on the backs of donkeys to the drying places. In other Spanish vineyards the grapes are made into raisins by dipping them in boiling lye, which wrinkles the skin and cures the flesh.

When the Californians first tried to dry raisins they were not successful. They did not know what grapes to use nor just how to cure them; but they sent men to the countries along the Mediterranean and elsewhere to learn the best methods of raisin making, and to-day our raisins are as delicious as any in the world.

In traveling over California we visit vineyards where the ripe grapes are gathered and their juice squeezed out to be made into wine. The juice is allowed to ferment and is then carefully stored in cellars for a time to cure, after which it is put into bottles or casks and shipped to the markets.

34. BERRIES

WE have many small fruits which are grown in large quantities, some of which are eaten fresh, and others are dried, canned, or otherwise preserved for the table.

Of these the chief are strawberries, blackberries, raspberries, currants, gooseberries, and cranberries, all of which, with the exception of cranberries, are to be found growing in almost every part of the United States. There are so many berries brought to our markets that they annually sell for one tenth as much as our vegetables.

Strawberries.

Several hundred thousand acres are devoted to raising them, and the largest part of them are grown in thickly populated neighborhoods, in such states as New York, Ohio, Michigan, Massachusetts, Illinois, Indiana, New Jersey, and Missouri.

We have all eaten strawberries. They are the most important of the small fruits, this crop giving employment to more men and bringing in more money than any of the others. They may be grown anywhere in America from Florida to Alaska; and in the highlands of Mexico there are climates where strawberries are ripe all the year round.

The strawberry grows wild in many parts of the United States. It may be found in fields or in woods and often along the fence corners. It is improved by cultivation, however, and the greater part of our product comes from beds of choice varieties, where the vines are carefully cultivated and the berries picked in baskets and packed in crates for shipment to the markets. Strawberries must be eaten a short time after they are picked, but, since refrigerator cars have been invented, it is possible to send them long distances. We have strawberry beds in our Southern States from which the early ripening berries are shipped in great quantities to the markets. Later in the year, the berries from the colder parts of the country come in, so that our strawberry season now lasts several months.

Have you ever visited the Blue Ridge Mountains? If you will go there at the right time, you may have all the blackberries and raspberries you can eat, for the picking. These fruits grow wild throughout the greater part of the Appalachian Chain and in many other places. They are also cultivated, and it is the cultivated varieties that give us the finest fruit. Both blackberries and raspberries are used largely for canning, and also for making jellies and jams.

Currants and gooseberries are grown almost altogether for canning. Gooseberries are often eaten in pies and in

tarts; and we remember how proud Oliver Goldsmith's Vicar of Wakefield was of his wife's home-made gooseberry wine. The gooseberry is especially fine in England, where it has been cultivated for hundreds of years. It is raised in the northern parts of our country, and especially in Indiana, which might be called our chief gooseberry state.

More important still is the currant, which we use in large quantities for jellies. We have eight different states each producing more than a million quarts of currant jelly every year.

The currant is found throughout our Northern States, in northern Europe, and also in Asia, where the delicious red currant of the Himalaya Mountains thrives as high as two miles or more above the sea.

In addition to these small fruits, we have some others, such as huckleberries and elderberries, which, although eaten to a considerable extent both fresh and canned, are of little value in commerce.

We have one berry which is odder, perhaps, than any of the others. It is of about the size of a common cherry, and so tart that if cooked without sugar it sets one's teeth on edge. It always makes its appearance upon our tables at Thanksgiving and Christmas, being used as a sauce with roast turkey or chicken. I refer to the cranberry, of which we produce about a million bushels a year, shipping them to all parts of our country.

The cranberry is a native of the United States and of Europe, but some of our varieties are larger and better than those of the Old World. They are found in the low boggy lands along the Atlantic Coast from Maine to New

Jersey, in parts of the Alleghany Mountains, and also in the swamps of Michigan, Minnesota, and Wisconsin.

Cranberries grow wild in some places, and in others upon cultivated vines. More than half of our crop is now raised in Massachusetts, and about one fourth of it in New Jersey. Indeed, Massachusetts, New Jersey, and Wiscon-

Gathering cranberries.

sin grow more than ninety per cent of these berries, a comparatively small area being devoted to the industry. The reason for this is the peculiar conditions necessary to cranberry culture. I venture to say that none of us has ever seen any other farm so odd as a cranberry farm. The land chosen must be low and boggy and so situated that the vines may be flooded at certain times of the year. The

soil must first be cleaned of bushes and other vegetation and then covered with a layer of sand, to keep the earth beneath damp and cool and to prevent other things from growing.

The plants are raised both from seeds and from cuttings, the sprouts being set out in rows, about fourteen inches apart. After planting, the grass and weeds must be kept down and the beds flooded from time to time. As the vines grow, they spread and run over the ground somewhat like strawberry vines. When they are about three years of age they begin to produce fruit.

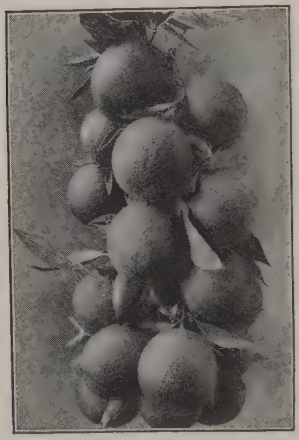
The cranberry blossoms appear in the early summer, and the berries are ripe in the fall. They are gathered by hand or by little rake scoops and are cleaned and sorted and then packed in barrels and crates for the market. The chief distributing points are New York, Philadelphia, Boston, Baltimore, and Chicago. The berries will keep for some weeks, and in the late fall they may be found on sale in almost every grocery store.

35. ORANGES, LEMONS, LIMES, POMELOS, CITRON, ETC.

WE are again in California this morning, although in different surroundings from where we saw grapes made into raisins. We are traveling through orchards of beautiful trees, whose green leaves shine as though varnished. In some orchards golden balls are peeping, like eyes, out of the leaves, and in others the trees are loaded with oval fruit of pale yellow or green. We are in the

great citrus fruit region of the Pacific Coast, where oranges and lemons enough to fill millions of boxes are raised every year.

Citrus fruits are different from any of the fruits we have yet examined, but they are, nevertheless, amongst the most delicious that come on our tables. What is finer than a great round yellow orange full of juice, or a pomelo ("grape fruit") sliced in half and powdered with sugar? On a hot day there is nothing so cooling as a glass of iced lemonade; and we all delight in the fruit cake and the plum pudding, the flavor of which is due largely to the citron within. Citrus fruits belong to a family from southern Asia which includes oranges, lemons, and limes, and also pomelos, citrons, and the bergamot used for perfumery. All these have a pulp with a sour, sweet, or bitter juice, a spongy or leathery rind, and smooth seeds. The leaves and the rind are full of oil, and the flowers also contain oil and have a peculiar fragrance.



Oranges.

Many of these fruits grow wild in India and in other warm parts of Asia; some of them have spines or thorns; and some have become very different through cultivation from what they originally were. It is said that the orange was once a berry, about as big as a marble, bitter, and full of seeds, and that it has been brought to its present size and flavor by cultivation and experiment throughout the ages.

Some people think that the apple of the Garden of Eden was really an orange; and there is a kind of a pomelo sold in Europe which is called the forbidden fruit. Ceylon also has a pulpy forbidden fruit which looks as though a bite had been taken out of it; and the natives say it was originally round and good to eat, but since Eve sinned it has always showed the mark of her bite and has been poisonous.

The chief citrus fruits grown in the United States are oranges, lemons, limes, and pomelos or grape fruit. They require about the same climate and soil, and are found in the tropics and the warmer parts of the temperate zones, all over the world. Oranges and lemons are largely cultivated in Portugal, Spain, Sicily, and other countries in and about the Mediterranean Sea. Asia Minor has delicious oranges, and those from Jaffa, the chief port of Palestine, are excellent. Oranges thrive in Porto Rico and in others of the West Indies, in Hawaii and in the Philippine Islands; and there are great quantities of them grown in Brazil, Paraguay, and some other South American countries. They are produced in China and Japan and throughout southern Asia, as well as in north and south Africa, and on almost all the islands of the South Seas. Our chief orange-growing regions are in Florida and California, the latter state producing the larger part of our crop. The same is true of our lemons and pomelos, so that we can learn more about these fruits in California than anywhere else.

Suppose we take a look at a great orange orchard, now ready for harvest. Here is one where they are picking the crop. They have brought wagon loads of boxes and scat-

tered them about under the trees. There are a score of pickers at work. Each has a sack fastened by a strap over his shoulders, into which he puts the ripe oranges, as he cuts them from the trees. He does not pull them off as we do apples, peaches, and pears; for the wound that would be thus left in the fruit would be liable to cause rot. Notice how carefully the men work. They drop the

Picking oranges in California.

oranges into the sack so gently that they are not bruised; and they empty the sacks slowly into the boxes.

When the boxes are filled they are carried in spring wagons to the packing houses. There is a load going out now, and if we follow it we can see how the fruit is prepared for the market. We soon reach the packing establishment, a long low shed, in and about which many men and women, as well as boys and girls, are at work. The

fruit first goes into the hands of the washers. Every orange must be well scrubbed before it is packed. In some places this work is done by boys and girls who scour the fruit with rough brushes to get the dirt, dust, and mold off; and in other places it is done by machinery which brushes the fruit as it rolls along in a stream of water.

After washing, the oranges are put into a trough, down which they roll into grading machines which separate them according to size. They are next carried into the shed to be packed. In the establishment we are visiting this work is done by Chinese, although in many other places it is performed by Americans. The Chinese have long slender fingers and are noted for their skill in handling fruit of all kinds. They take up each orange, wrap it in a piece of tissue paper, upon which is printed the trade-mark of the shipper, and then lay it carefully in a box. Each box is just two feet long, one foot wide, and one foot deep. The oranges packed in one box are of about the same size; and the boxes contain a larger or smaller number of oranges, according to the grade of the fruit. Some of the fruit is so large that sixty oranges will just fill a box, and some so small that three hundred are required to occupy the same space. The oranges are so fitted in that they rise a little above the sides of the box; and the covers are pressed down into place so carefully that the fruit is squeezed close together, but is not injured.

After this the boxes are nailed up and loaded upon the cars for their long journey over the Rocky Mountain plateau to the markets. The cars are well ventilated, the boxes being so arranged that the air can circulate freely among them; and, if it is warm, iced cars are used.

Oranges are sent from Florida to the north in much the same way. The Florida fruit is delicious, and it is consumed in large quantities in the eastern part of our country. We also import many oranges from the West Indies and from the lands in and about the Mediterranean Sea. The fruit keeps well, and it is often several weeks between the time of picking and eating.

During our stay the manager chats with us about orange raising. He tells us his trees originally came from the seeds of the hardier varieties, which are sown in nurseries, and that they are budded for choice fruit before planting. About two years after budding, they are ready for setting out and are then planted about twenty feet apart in the orchards. After this they must be well cultivated and kept clean of weeds. Many of the orchards are irrigated, a basin about ten feet square being dug about each tree, into which, from time to time, the water is turned.

An orange tree begins to bear at four years of age, and if properly trimmed and cared for, it will produce five hundred or more oranges every year for a generation or so. Indeed, it is said that there are orange trees several hundred years old which are still yielding fruit.

Oranges are of many varieties. In some the skin is tight to the pulp and in others, such as the mandarin and the tangerine, it is so loose that it may be pulled off like a glove, such kinds being called kid glove oranges. Some oranges are full of seeds, and others have no seeds whatever. The navel orange is a seedless orange. It was first brought to the United States from Bahia, Brazil, in the shape of a cutting, and planted in our Agricultural

Gardens in Washington. In due time the cutting became a tree and produced such delicious fruit that buds from it were sent to California; and thereby originated the navel orange industry, which now forms one of the most prosperous branches of our citrus fruit business.

Our next few days are spent in wandering about from one lemon grove to another. Lemon trees are not quite

Lemon pickers in California.

so high as orange trees, but they look much the same. Their blossoms are purplish on the outside, and they smell less sweet than those of the orange. The fruit is light yellow; and the green lemons fairly set our teeth on edge, as we taste them.

Lemon trees are grown from lemon buds, set into seedling sour-orange sprouts. The trees are planted like the

orange, and the fruit is gathered in about the same way, save that each picker has a steel ring about two and one-fourth inches wide. He passes this ring over each lemon before cutting its stem, in order to get just the right size demanded by the market. People do not want large lemons, and the kinds most desired are of such a size that it takes from three hundred and sixty to four hundred and

Grading lemons.

twenty of them to fill a box. If the lemons fit the ring they are picked, no matter whether they are green or ripe, although all the ripe ones are picked anyway. The ripe lemons are sometimes shipped at once to the market, while the green ones are piled away in boxes in the warehouses to ripen. It usually requires one or two months to fit a lemon for the market.

Lemons, like oranges, have to be washed. They must be carefully packed. When loaded, long strips of wood

are nailed across the cars in order that the boxes may not be jarred on their way over the continent. Lemons usually ripen in winter, but the demand for them in our country is not great until summer, so they are often held until then.

The lime might be called the lemon's sour little sister. It grows wild in Malaysia and India ; and the trees are so thorny that they are sometimes used as a hedge. Limes are cultivated in the West Indies, and also to some extent in Florida. The fruit has a thin skin and a light yellow pulp, full of an acid juice, from which is made a delicious drink similar to lemonade.

The pomelo or grape-fruit tree looks much like an orange tree, and it is cultivated in about the same way. Its fruit is several times as large as the largest orange. It is of a light yellow color and it contains a pulp which is somewhat acid and which, at the same time, has a bitter taste which many people like. It is largely used throughout our country and elsewhere as a breakfast fruit, and also for dessert. It is grown in Florida and California.

36. PINEAPPLES AND BANANAS

TO-DAY we shall consider two fruits of warm climates which are not found on bushes or trees. They resemble vegetables in that one grows on a stalk in a way not unlike a cabbage, and the other grows in great bunches on a plant which shoots up to a height of fifteen or more feet. Nevertheless, the first of these fruits is one of the most delicious, and the second one of the most useful,

known to mankind. One is the pineapple and the other the banana.

The pineapple is a native of tropical America. It was taken to Europe by the Spaniards, and, as early as the seventeenth century, was cultivated in Holland and in England. It had to be grown in glass houses, however, and was too costly to be eaten by any but the nobles and other rich people. To-day pineapples are found in nearly all the markets of this country and Europe. They are raised in the West Indies and in the Bahamas for export to the United States, and are sent from our Hawaiian Islands to San Francisco. We also raise some in Florida and California. The pineapples of Europe come chiefly from the Azores, the West Indies, and parts of North Africa; while the Australian markets are supplied by those parts of Queensland which lie near the Equator.

Pineapples will not grow except in warm climates. They are a tropical and subtropical fruit, which Jack Frost kills when it comes within his reach. Our Florida pineapple plantations are in the southern part of that state; and even there, the pineapples are often grown under sheds to guard them from the cold. In Porto Rico and Hawaii they are raised out of doors, as they are in most other tropical countries.

Suppose we go to Cuba and visit a great pineapple plantation. It is only a few hours' ride from Florida across to Havana, where we can get a railroad which will take us right to the pineapple fields. The farm we select belongs to an American, who ships his fruit to New York, Tampa, and New Orleans, whence it is sent to our interior cities.

Stand with me in the midst of the plantation. We are surrounded by hundreds of acres of plants. They stretch out on all sides of us almost as far as our eyes can reach, forming a carpet of reddish bronze, made up of millions of plants bearing ripe fruit. Close to us the pineapples are distinct, and we can see the great red and yellow fruit,

A pineapple plantation in Cuba.

each surrounded by its long green cactus-like leaves, tipped with crimson. Farther away the pineapples and leaves seem blended together; and the whole field, in the distance, looks like a gorgeous cloth more splendid than the dress of any queen, reaching on and out on every side.

The pineapples are in rows, but they are set so close together that it is safe to say there are a million or so

growing within the range of our eyes. That long low building in the center of the orchard is the packing shed. There the fruit is gathered when ripe and nailed up in crates, which go by the railroad to the steamers loading for the United States. The pineapples are planted by setting out the slips, or suckers, which grow about the

Packing pineapples for shipment.

base or the bunch of leaves at the top of the fruit. They are carefully cultivated until they begin to bear and for some time thereafter; although a plantation will last several years without replanting. The fruit is picked green, and ripens on its way to the market. Ordinary pineapples are four or five inches thick and from six to ten inches long; but the larger specimens often weigh as much as fifteen, and sometimes twenty, and even more, pounds apiece.

Leaving our pineapple plantation, we cross Cuba to the northeastern coast about Nipe Bay. Here are some of the largest banana plantations of the world. There are millions of plants, covering thousands of acres, and when the fruit is ripe, great ships loaded with it are dispatched regularly to New York.

In the distance, the bananas make us think of fields of green corn rising and falling in the wind, but as we come closer we see that each stalk is a great plant with a green trunk, almost a foot thick at the bottom and rising upward eight or ten feet, before the wide leaves, some of which are ten feet long, extend out like palm leaves and bend over. Some of the plants have suckers, like corn suckers, springing out of the ground at their roots, and often two or three plants are growing together. The rows are not more than six feet apart ; and walking through the plantation is like making our way through a forest of green trunks upholding these wide green leaves which meet overhead and shut out the sun.

There is a banana plant in blossom. I venture to say none of us has ever seen such a blossom before. It looks more like a great bud than a flower. It is six inches long and, at its base, as big around as my arm. Just back of it, sprouting out from the place where the leaves join the trunk, is a great bunch of bananas, the blossom ending the bunch. The stem of the bunch hangs down, and the bananas themselves grow upward, and not downward, as many suppose. Let us stop and count the bananas on that bunch. It has seventy-four. On a larger plant farther over is a bunch containing more than a hundred, while on other plants are smaller bunches having fifty or less.

This plantation is three years of age. It was set out from suckers like those we see at the roots, and it has been well cultivated until now. There are no weeds anywhere, and the plants are kept free from grass. Each plant bears

The bananas grow upward.

but one bunch and then dies, but the sprouts at the base grow up year after year, so that a plantation lasts a long time.

In harvesting bananas the plant is chopped almost in half. As it falls, it is caught and the bunch of bananas is cut off; after which the plant is chopped down to allow the sprouts at the foot to secure the full strength of the roots.

As we go onward, we come to a place where the men are gathering the fruit. The bunches are cut while the

fruit is still green. There is not a ripe or yellow banana among them. A little later we watch the loading of a steamer, and are told that the fruit will be still green when taken off in New York, and that it will not turn yellow until about the time it reaches the market stands. Bananas will keep easily for several weeks, and they are cut green in order that they may stand the journey to all parts of our country.

Brazilian bañana peddler.

The banana, as used by us, is a luxury. In many parts of the world it forms the principal food. It is eaten in all tropical countries, and some savage and semicivilized people have, at times, little else. This is so in nearly all the equatorial islands, in the Dutch East Indies, Malaysia, and in many parts of equatorial Africa.

The banana gives the native of central Africa not only his food and drink, but his string, soap, and clothing. He eats the green fruit of the plantain, which is closely allied to the banana, cooked as a vegetable, and when ripe it serves as a dessert. With him bananas largely take the place of wheat and corn, for he steams them and makes them up into flour. He uses banana leaves to thatch his

house, and makes them answer the purposes of paper, tablecloths, and napkins. The stems are sometimes made into fences, and the pith is scraped out and used as a sponge. The fibers form excellent string, and they are also woven into sun hats and shields.

In some parts of the world savages make an intoxicating drink from the banana which might be called banana brandy, and also another liquor somewhat like beer. There are other drinks made from this fruit which are not intoxicating at all. Not only in Africa, but in parts of the West Indies and elsewhere, if the banana crop is good, the natives are prosperous; and, if it fails, they are likely to suffer from want.

37. OLIVES AND VEGETABLE OILS

IN ancient times there was a contest between Minerva, the Goddess of Wisdom, and Neptune, the God of the Sea, as to which should have the Greek city of Athens under his protection. The other gods came together and decided that this right should be given to the one who could offer the gift most useful to man. Thereupon Neptune brought forth the horse, and Minerva, the olive tree. The gods gave their judgment that the olive was the more useful, and Athens was awarded to Minerva, who sometimes goes by the name of Pallas Athene.

The olive is one of the oldest of fruits. The dove which Noah sent forth from the ark when the floods were abating came back with an olive leaf in its mouth; and we read of olives being used in early times in the countries

about the Mediterranean Sea. It is said that they came originally from southern Europe and Asia Minor. The Atlas regions of northern Africa seem to be peculiarly fitted for them, and the same is true of the southern part of the great central valley of California and of certain regions in Mexico and Peru. Italy raises more olives than any other country, and they are also grown for export in Algeria and Tunis, and in France, Spain, Greece, and Asia Minor. We still import olives and olive oil from Italy and Spain, although we now have large olive orchards on the Pacific Coast and are raising quantities of olives every year.

Suppose we visit one of these orchards in southern California. The trees are loaded with fruit that looks somewhat like plums, but the leaves are of a darker green than the plum tree, and the trunks and branches are twisted in all sorts of shapes, looking as though they had been made so by the wind.

Olive trees are propagated from the seed, from cuttings, sprouts, and suckers, and by layering. They are set out in orchards, about thirty or forty feet apart, and begin to bear fruit at two or three years of age, although it is not until they are seven years old that they yield profitable crops. They bear more fruit as they grow older, until they are about thirty years old. At ten years of age a good tree may have six or seven gallons of olives upon it, and later it may produce as much as fifty gallons.

The olive is very long lived. There are some trees in California which were planted before we signed our Declaration of Independence; and in southern Europe are many which are known to be several hundred years old. The people there claim that the olive tree will live a thousand

years, and they have a saying that the man who plants olives lays up riches for his children's children.

In California the olive orchards are carefully cultivated. The one we are visiting is about twenty years old, but it is still plowed several times a year and is kept free from weeds. The trees are now loaded with fruit, and the

Picking olives in California.

people are harvesting the crop. A number of men and women, together with many boys and girls, are moving about under the trees. Some hold out sheets of canvas, while others shake each limb and twig, so that the olives fall into the sheets. The fruit that remains on the trees is plucked by hand.

After picking, the olives are sorted. Some of them are

almost black, while others are light brown or dark green. The black olives are ripe and ready to be pressed into oil. The green ones will be used for pickling; they will be graded, and those of uniform size will be put up in bottles or tubs and sold all over the country. Ripe olives are also pickled, but they are black when bottled.

Suppose we follow that load of ripe fruit which they are taking off to the oil mill. We go with the wagon and see

Grading olives according to size.

the black olives thrown into a sort of mortar, in which is a heavy stone, so moved around by an engine that it crushes the olives to paste. After being thoroughly crushed, they are taken out and packed by hand into flat bags made of matting, each of which holds about a half bushel. These mats are piled, one on top of the other, in a press which works so gradually that they must remain in it for several hours before all the juice, water, and oil are squeezed

out. The oil which comes first is the best. It is almost clear white. It is called virgin oil and is used chiefly for salads. That which comes later is of a lower grade, and the last is the poorest.

In some orchards the fruit is dried in the sun or by artificial heat before it is pressed, and the pulp is pressed again and again for the different grades of oil. Before the last pressing it is soaked with hot water, and the result is a low grade oil, used for the table and also for machinery and burning.

After the oil has been taken out of the pulp, it is drawn off carefully, filtered, and stored in a cool dark place ready for bottling. If exposed to light or heat, it soon becomes rancid, and the greatest care is taken to keep it sweet and cool.

We use olive oil for salads and also in manufacturing soap and tobacco and for mechanical purposes. We import a great quantity every year, in addition to that which we raise ourselves.

In southern Europe and in the other lands about the Mediterranean Sea olive oil, to a large extent, takes the place of butter. It is used not only in salads, but upon bread and vegetables and for cooking. In some localities olives and olive oil serve even for meat and bread; and many a Spaniard, when upon a long journey, ties a wicker basket of this fruit to his saddle horn and eats it as he rides.

We have another oil much like olive oil which is made from cotton-seed. For a long time these seeds went to waste, but now they are ground up into oil, and the refuse therefrom is made into cattle feed and

fertilizer. The products from our cotton-seed now yield annually a vast sum. In the year 1900 the seeds used weighed several million tons, and they produced oil, meal, and other things valued at thirty-three million dollars.

In making this oil the lint is first taken off and sold as raw cotton, and the seeds are then sifted and cleaned. The hulls are cracked by machinery and separated from the kernels. The kernels are then run through heavy rolls to squeeze out the oil, which is drawn off into settling tanks. It is afterward refined, when it looks and tastes much like olive oil. In some cases the kernels are cooked before they are crushed, but the best oil is made when they are pressed cold. Cotton-seed oil is used largely for cooking, and many prefer it as a substitute for lard or butter. It is sometimes employed to adulterate olive oil, lard, and other things, and it is also used for making soap, paint, drugs, and for oiling machinery, and for lighting.

Sunflowers in Russia.

The Russians raise sunflowers for their seeds. These contain a rich oil that is used largely in salads and in cooking, and also for lighting and for making candles

and soaps. The people eat the seeds as we do peanuts, keeping a handful or so in their pockets and nibbling away at them from time to time. Each sunflower has from eight hundred to one thousand seeds, and these seeds are in such demand for various purposes that about forty million pounds of them are raised every year. The Russians sow the seeds in the fall or in the early spring, drilling them in, in rows about eighteen inches apart, and thinning out the plants, so as to leave a space of a foot or so between them. An acre of sunflowers should yield about fifty bushels of seeds; and these, when pressed, will give about one gallon of oil per bushel.

The Chinese make oil from certain kinds of beans, using the refuse, or bean cake, as food for both man and animal and also as fertilizer. They have, moreover, an oil which is extensively grown in their own and in other countries and which is largely imported by us. This oil could hardly be used for cooking, although it is of great value when one has eaten too much. It is castor oil, made of the seed of the castor oil plant. This plant is a native of India but is now cultivated in most warm countries. It varies in size from a shrub to a tree fifteen or twenty feet in height. In extracting the oil the seeds are first crushed between heavy rollers and then pressed in bags under a screw press.

There are a few other vegetable oils which are used for cooking and eating in different parts of the world, but none of them is so important as those we have considered. Valuable oils are also made from several species of nuts, such as peanuts, palm nuts, and cocoanuts, as we shall learn farther on in our travels.

38. DATES AND FIGS

IS it not strange that one of the sweetest of fruits should come from the desert? The palm that bears the date thrives in the midst of burning sands, if its roots can have plenty of moisture. It is grown by irrigation in the oases of the Sahara Desert, almost everywhere in the valley of the Nile, in the fertile spots upon the Desert of Arabia, and especially along the Shat-el-Arab River, at the head of the Persian Gulf.

The Shat-el-Arab is formed by the union of the Tigris and the Euphrates at Kurna; and it flows from there for a distance of seventy miles down to the Gulf of Persia, through some of the richest soil and one of the hottest climates of the world. Here, in midsummer, the thermometer rises to one hundred and twenty degrees in the shade, and the few European inhabitants sleep in bedrooms cooled by fanning mills which force the air through wet screens. Even the natives spend the hot nights on the roofs of their houses; and in the warmer parts of the day most people stay within doors. In winter the climate is as delightful as that of southern California. It seldom rains, and the air is dry and clear almost all the year round.

This region is said to be the birthplace of the date palm. According to the Arabs, it was here that the Garden of Eden was situated. It is only a few hundred miles above here, on the banks of the Euphrates, that Babylon was situated, and a like distance away, upon the Tigris, that Bagdad now stands. The climate here is exactly suited to the

date palm, and the Shat-el-Arab Valley is believed to contain the largest continuous orchard of the world. It ranges from less than a mile to more than three miles in width, and has more than five million date trees growing along both sides of the river.

The slope of the valley is such that it can be easily irrigated. The wide muddy Shat-el-Arab carries the vast volume of the Euphrates and the Tigris Rivers; and during the periodic floods it fills the irrigating canals, inclosing the date trees in a network of waters. At such times the larger canals look like rivers running through a forest of palms; and the smaller ones form silver ropes, winding their way in and out about the date trees. The water is full of silt, and this, settling, fertilizes the land.

In a Persian date orchard.

There are date orchards along the Tigris and the Euphrates Rivers, and also near the Gulf of Oman, farther south; so that all together the Persian Gulf regions have more date palms than any other part of the earth. They have fifteen or twenty million trees, annually yielding more than one hundred thousand pounds of fruit. They furnish

most of the dates sold in our American markets; although we get some from the Sahara and from Egypt, and are now growing a few ourselves in the hot dry irrigated lands of Arizona and southern California.

The date palm may be raised from the seed, but it is usually grown from suckers which sprout out about the trunks of the older trees. These are set out at about one hundred to the acre, and, if well watered, they strike root at once and, within four or five years, begin to bear fruit. They come into full bearing at eleven or more years of age, and after that they may yield for a hundred years. When mature, a tree should produce eight or ten bunches, each containing from twelve to twenty pounds of dates.

Date flower.

In the Sahara the date blossoms in April. The flowers are perfectly white, and this is the color of the dates when they are first formed. A little later they turn green, and toward the end of the summer they take on a reddish or a yellowish tinge, a sign that they are ripening. They grow redder or yellower as they become riper; and, when dead ripe, the yellow dates are the color of amber, and the red dates have turned to a reddish brown or black. Green dates are not fit to eat, and they pucker one's mouth like a green persimmon. As they ripen, this taste passes away, they gradually sweeten, and, when dead ripe, they are almost as sweet as sugar itself. They now begin to dry on the trees and are ready to be gathered and shipped to the market.

Dates are of as many different varieties as apples. More than one hundred kinds of dates are grown in the Sahara and a great number in the Persian Gulf region. Different markets demand different dates. Europe and America have their favorites, while India and the Orient prefer other kinds. Some dates will stand shipment better than others, and some are especially delicious when fresh from the trees.

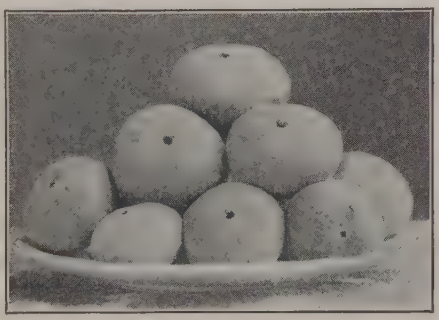
The dates shipped to America are sweet dates. They are allowed to dry on the trees for a week or so after they ripen. This shrinks them, and they can then be shipped to better advantage. They are of a soft variety, and are full of juice, which must be drained off before they are packed. They are brought here in bags of matting or in long wooden boxes, the choicest dates often being repacked at the ports before they are shipped to New York.

The favorite date of the natives of the Sahara contains much less sugar than that sent to the United States. It is a dry date which is almost unknown to us, but which largely takes the place of bread in that wild desert region. These dates are not soft or sticky when ripe, and if stored in dry places, they can be kept a long time. They form a healthful food and are eaten by man and beast, being often fed to camels and even to dogs.

The date palm is the most important of all desert palms. In the Sahara Desert its fruit often takes the place of both bread and meat. There are parts of Arabia where the people live almost entirely upon dates and bread, with an occasional feast of a sheep, goat, or chicken. The sweet dates furnish a sirup or date honey and the juice of the green dates can be turned into vinegar. The Bedouins

make the ripe fruit into a paste which hardens so that it can be kept for a long time; and dry dates are sometimes pulverized and cooked as meal. The seeds or stones are crushed and fed to camels, goats, sheep, and horses, and there is an edible bud at the crown of the tree which is known as palm cabbage and which, when the tree falls, is eaten as a vegetable.

The wood of this palm is very valuable in the desert lands where it grows. It is used for fencing and for house building. The fibers of the leaves and trunk furnish the tow with which the Arabs stuff their saddles, and they are also used for rope making. A fine thread is made from the stem of the fruit, and mats and baskets are woven from the split leaves.



Green figs.

There is another fruit which can be grown in much the same surroundings as the date, but which also thrives in subtropical regions and even in the warmer parts of our country. This is the fig, which is supposed to have originated in Asia, and which is now grown commercially in many of the countries about the Mediterranean Sea.

Fig trees are found in most of our Southern States; and large orchards of Smyrna trees have been planted in California and are yielding several million pounds of figs every year. In some oases of the Sahara Desert fig trees are

raised under the date palms; they are common in Algeria and Morocco; and they thrive better, perhaps, in Syria than anywhere else. The chief port from which they are sent to the United States is Smyrna, about which are large orchards producing a delicious variety of this fruit.

Fig trees are grown from seeds or from cuttings and also by budding. They are set out sixteen or more feet apart

Packing figs in California.

in the orchard, and when full-grown are tall, with wide branches and large beautiful leaves. They begin to yield fruit at three years of age, and after that they will bear two or three crops every year for a century or longer. Figs on the trees look plump, and in shape they resemble a small tomato. They are of different colors, according to the variety, some being white, some black, some purple, and others yellow or green. The purple figs are the best, although the yellow ones are the most beautiful.

Figs are gathered when they are dead ripe and laid

upon boards in the sun to dry. After this they are pressed into shape, one by one, and packed up in boxes to be sent to the markets.

39. SOME OTHER TROPICAL FRUITS

IN addition to the fruits we have already examined, there are many others which are eaten here and there over the world, but have no important part in commerce. The mango, for instance, might be called the apple of the tropics. It is a luscious juicy fruit of about the size of a goose egg, or larger, and of much the same shape. It grows well in the East Indies, in most parts of the Philippine Islands, and in Central and South America, the West Indies, and elsewhere.

The guava, from which the famed guava jelly is made, is a yellow-skinned fruit about as big around as a silver dollar. It is rather sweet and of a light red color. The guava tree looks somewhat like a plum tree. It is grown in the West Indies, as well as in Brazil, Paraguay, and other tropical parts of the world.

Many of the fruits of the warm zones are of enormous size. The breadfruit, for instance, grows almost as large as a football; it is round or oval in shape and contains a fibrous pulp which is white and mealy, looking somewhat like new bread. It is eaten before it is ripe, and it forms a staple article of food among the natives of the South Sea and the East Indian Islands. The South Sea Islanders cook breadfruit in ovens made in the earth. They place it between layers of heated stones and green

leaves; first a layer of hot stones, then leaves, and then breadfruit; then more stones, more leaves, and more fruit, until the oven is full. They then spread earth over all. The hot stones soon create a steam from the moisture in the leaves and the fruit, and within a short time the breadfruit is ready to eat.

Breadfruit tree.

The jackfruit is of the same nature as the breadfruit, but coarser, and two or three times as large. Another fruit of these same regions is the durian, which has so disgusting a smell that many people will not taste it. Nevertheless, it is delicious, having a pulp of fine flavor that is not unlike that of cream. The durian is about as large as a good-sized cocoanut; it has a rind covered with prickly spines and looks like a little hedgehog rolled up.

How would you like to pick melons from trees? You may do that in Cuba, Porto Rico, and other countries of about the same latitude. The papaya tree has a fruit

which tastes and looks like a muskmelon. It has soft sweet yellow flesh, with many small black seeds, and is so easily digested that people can eat it when they can eat nothing else. Indeed, the papaya aids the stomach in digesting other foods; and it is said that tough meat, if dipped in water containing a little papaya juice, will become tender. The papaya tree is seldom more than twenty-five feet high, and the melonlike fruit grows on stems attached to the trunk near the top.

Papaya tree.

We have many wild persimmons in the United States. They are found in great quantities in Virginia; and some of us have eaten them when dead ripe in the fall, after the first hard frost. They are no larger than plums, and they are by no means bad, I assure you. Nevertheless, they do not compare with the persimmons of Japan, China, Korea, and the East Indies. These are as big as good-sized tomatoes and are of about the same color; they have a soft sweet pulp and can be eaten with a spoon.

The mangosteen is a famous delicacy in some of the warmest parts of the world. It is a native of the Molucca Islands, but is also grown in Java, Ceylon, and other tropical

countries. This fruit is shaped like a small orange; it is of a dark reddish brown color, and the pulp within is white, with a tinge of rose pink. It has a fine flavor and is one of the choicest fruits of the tropics.

The pomegranate is a native of southwestern Asia, and it grows also in other parts of the world where the climate is warm. It is of about the size of a lemon and is full of seeds, each inclosed in a pulp. The pulp is eaten and is used also for making a drink.

40. NUTS

WE shall go nutting to-day, and our trip will take us over the greater part of the globe. Nuts have always had an important place as a food for man. They are eaten almost everywhere. They are gathered by the natives of the forest wilds for the traders, and in civilized countries they are raised in orchards and exported all over the world.

Our principal commercial food nuts are almonds, English walnuts, cocoanuts, pecans, Brazil nuts, hazelnuts, chestnuts, and hickory nuts. We spend several million dollars every year importing them, and more for almonds and English walnuts than for any of the others.

We raise some almonds in California; but, nevertheless, we buy annually almost a million dollars' worth from Spain and from other countries about the Mediterranean Sea. Almonds are of two kinds, sweet and bitter. The bitter ones are used to make flavoring extracts and prussic acid and are not good to eat. Sweet almonds are used for

food and are sold everywhere in our grocery stores. We eat them raw and cooked and also in cakes, candies, and other confections. Sugared almonds are delicious, and so are burnt almonds and blanched almonds, when salted.

Almond trees resemble peach trees, and the fruit is much like the peach, save that it has a thin flesh, the nut

Almond trees resemble peach trees.

forming the stone. When the almond ripens, the skin breaks open, and, as the flesh shrivels and dries, the nut falls to the ground. In gathering the crop, men and boys go through the orchards and pick up the nuts; and they sometimes shake them off upon sheets spread under the trees. The almonds are packed in sacks or bales to be shipped to the markets.

If we lived in certain parts of California, we might have

a two weeks' vacation every October, in order to help gather English walnuts. These nuts are now grown there in large quantities; and, although we also import many from France, Spain, and Italy, we raise some of the best of the world. Walnut trees are set out in rows just as apple trees are, and they are carefully cultivated until they are six or seven years old, when they begin to bear. They keep on bearing more and more nuts every year for about twenty years, and, if well cared for, they may bear longer than the lifetime of a man.

The nuts begin to ripen about the middle of September, and fall from that time on until the last of November. In the height of the season all the boys and the girls of the neighborhood, as well as such men and women as can be had, go over the great orchards again and again, gathering the nuts into pails, cans, or sacks. The children are paid so much a pound for all they pick up, and a boy or a girl can make very good wages. Sometimes bamboo poles are used to knock the nuts from the trees.

After the walnuts are gathered, they are taken to the drying grounds and spread out in trays about five inches deep until thoroughly dry. The shells are now brown, and they must be whitened before the nuts are ready for sale. This is done by dipping them in water mixed with certain chemicals, which turns them to the color of the nuts sold in our stores. They are then rinsed in clear water and dried again.

In addition to the English walnut, we have the black walnut, which grows wild in many parts of the United States, and also the white walnut, or butternut, which is noted for its delicious sweet kernel. These nuts, how-

ever, are used chiefly in the localities where they are grown and are seldom exported. The same is true of our hickory nuts, which we gather and lay away to crack on winter nights; and also of acorns, pignuts, and beechnuts, which are eaten by the hogs, as they roam through the woods.

It is different with the pecan, which belongs to the family of hickories. It grows in large quantities throughout our Southern States and is cultivated in Texas and in many parts of the Mississippi Valley. The trees are set out about forty feet apart. They begin to bear in five or six years and, when they are twenty years old, some trees will yield as much as twenty bushels of nuts in one year. There are different varieties of pecans; some large and some small, and some with shells so thin that they can be crushed with the fingers.

Most of our chestnuts are small, and we use them chiefly as a luxury, eating them raw or roasted. They are frequently sold hot from the ovens, by peddlers, on the street corners of our cities; and are sometimes cooked by boys, in corn poppers, over the coals. In southern Europe and in Japan, China, and Korea, there are chestnuts as big as buckeyes, and they are grown extensively for food. In southern France the peasants eat these nuts twice a day during the fall and winter; and in the towns there are regular chestnut peddlers who carry the steamed meats through the streets and sell them to the working people for breakfast. In some parts of the Alps the peasants grind up dried chestnuts and make flour of them; and in Sicily and Italy they are stewed, roasted, and served in other ways.

We import many of these large chestnuts to use for making candy and for stuffing roast turkey; and in recent years we have been growing them ourselves, either by planting the nuts or by grafting cuttings of the foreign trees upon our native chestnut sprouts. Such trees thrive, and the sprouts, fed by the native roots, grow rapidly and are soon bearing fruit.

The pistachio nut comes from Syria, and the pine nut, which is of about the same size, is found in many parts of southern Europe, as well as in Korea and other lands of similar climates. Both of these nuts are eaten raw and roasted, and they are often ground up or coated with sugar and sold as a candy. We have also hazelnuts and filberts, which are used in confections or are eaten raw.

There are two nuts grown in tropical lands which are now exported to all parts of the globe. These are the cocoanut and the Brazil nut. The Brazil nut grows chiefly in northern South America, along the banks of the Amazon and the Orinoco Rivers; and the cocoanut is found almost everywhere near the seacoast in the hot parts of the world.

The Brazil nut is remarkable in that it is a nut within a nut. It grows inside a shell bigger than that of the largest cocoanut, from eighteen to twenty-four nuts being found in each shell. The tree which produces it rises to a height of more than one hundred feet; and if one of these great nuts should be brushed off by the wind or thrown down by a monkey so that it should strike a traveler beneath, it would probably kill him. Brazil nuts are sometimes called cream nuts. They are about as long as a boy's little finger; they have hard black or brown shells

and white kernels full of oil. They may be found in almost any of our grocery stores.

Far more important is the cocoanut. It is grown by the millions on the tropical islands of the Pacific, and we find it in vast groves in Samoa and in the Philippines. It sprouts up quickly on the coral atolls in mid-ocean and

A cocoanut tree.

along the seashore in Africa, South America, Asia, and in the West Indies.

This tree is a palm which begins to bear at seven or eight years of age and produces fruit for many years. The cocoanuts grow in great bunches where the leaves sprout out at the top of the trunk; and a good tree will produce a hundred nuts a year. The nuts fall when they

are ripe, and the rough outside husks are taken off before they are shipped to our markets.

The meat of the cocoanut is sometimes eaten raw, but it is chiefly valuable when dried, in which shape it is known as copra and is exported to Europe and the United States to be ground up and pressed into oil for making soap and

Making copra in Samoa.

for use in certain manufactures. Seven or eight cocoanuts will produce about one quart of oil, and the refuse from the pressing forms a good food for stock. Dried cocoanut, or copra, is one of the principal articles of commerce in the South Sea Islands; and many of our Samoan and Filipino cousins get a large part of their money from their cocoanut groves. In making copra the rough husks

of the nuts must be first taken off. The inside shells are then broken, and the kernels, cut in pieces, are dried in the sun and packed for export.

We use considerable ripe cocoanut meat in making candy and cake. Some of us, no doubt, have tasted cocoanut milk, the juice of the ripe cocoanut. The best milk is from the green nut, and this can be had only in the lands of the cocoanut. It is as clear as water and is most delicious when drunk direct from the shell.

Another tree of this family which yields nuts in commercial quantities is the African oil palm, whose fruit compares to the cocoanut much as a glass marble does to a football. These nuts grow in clusters of a thousand or more. Their kernels range in size from sparrow eggs to pigeon eggs. They contain an oil which is used by the natives for cooking and lighting and which is exported by the ship load to Europe for soap making and for other manufactures.

41. COFFEE

COFFEE, tea, and cacao are so largely consumed by mankind that they form important articles of commerce and industry. So much coffee is produced every year that if it were evenly divided there would be more than a pound and a half for every man, woman, and child; and so many coffee trees are now growing that every inhabitant of the world might have a tree of his own, and leave many millions to spare.

We have no coffee trees in the United States proper, on

account of our cold climate; nevertheless, we buy more coffee than any other country. We use twice as much per capita as the Germans and many times as much as the Belgians, Austro-Hungarians, Dutch, British, or Canadians, who rank next to us among the coffee drinkers of the world. We buy enough in a year to equal twelve pounds for every person in our country, and our coffee bill often amounts to ninety million dollars. Of this great sum, every American family which drinks coffee pays a part; and, therefore, we are personally interested in learning about it and how it is grown.

Coffee is the seed of an evergreen tree which is found in many parts of the tropics. Under cultivation it is pruned down to a height of ten feet or less. It has leaves somewhat resembling those of the laurel, and bears small white blossoms and berries of about the size of a cranberry and of the same color and shape. Inside each berry are one or two seeds or beans which form the coffee of commerce. The seeds are usually half globes, fitted together with the flat sides facing each other and surrounded by a sweet fleshy pulp. The berries grow close to the stalk all over the tree. They are picked off when ripe, and the seeds, properly dried and cleaned, are shipped all over the world.

Coffee blossoms and berries.

The coffee tree is supposed to have originated in Abyssinia and to have received its name from the province of Kaffa, where it still grows wild. It was first carried over to Arabia and planted there in the districts from where the purest of the famed Mocha coffee comes. Toward the end of the seventeenth century it was taken to Java and then to other tropical countries all over the world.

It thrives best in latitudes between fifteen degrees north and south of the Equator, although it is cultivated with success in places thirty degrees south or north, where the temperature does not fall below fifty-five above zero. Jack Frost is a deadly enemy to this tree, and excessive heat hinders its growth. It is usually found some distance back from the sea and especially upon well-watered mountain slopes, from one to four thousand feet above sea level.

The chief coffee regions are upon our own hemisphere; and nearly all the world's crop comes from South America, and especially from Brazil. Central America and the West Indies also produce coffee abundantly.

The total crop of the world amounts in some years to as much as twenty-three hundred million pounds, of which twenty-one hundred million and more come from this hemisphere; most of the remainder being from Java and Sumatra in the Dutch East Indies, and from Ceylon and some other islands belonging to the British, in the Indian Ocean. Coffee is also raised in Australia, in Madagascar, and in parts of eastern and western Africa; while Hawaii and the Philippine Islands produce some for export. A few million pounds of excellent coffee are grown in the mountainous regions of Cuba and Porto Rico, and about two hundred million pounds are annually grown in Mexico and

Central America. Haiti and San Domingo produce a considerable amount, and so do Colombia, Venezuela, Ecuador, Peru, and Chile. The chief of all coffee countries, however, is Brazil, which yields at least two thirds of the world's crop, furnishing more than enough each year to give one pound to every man, woman, and child upon earth.

The greater part of the coffee used by the United States comes from Brazil, and we can learn all about it by making a tour through the highlands southwest of Rio de Janeiro, where more coffee is grown than anywhere else in the world. The land there is from one thousand to three thousand feet above the sea; it is gently rolling, and the hillsides are covered with coffee plantations.

We take passage on one of the coffee steamers at New York; and after sailing southeastwardly many days, we reach the coast of Brazil at Bahia, where we turn to the southwest and finally land at Santos, the port for Saõ Paulo. Here we climb the highlands by train, over a cog railroad; and after a journey on the cars of several hundred miles across country, we find ourselves on one of the largest of the coffee estates. We have been riding for hours through a region covered with coffee trees and have gone to and fro on the little railroad which carries the berrries from the trees to the factory and reaches every part of this mighty plantation.

How interesting it is! Standing upon the higher hills there are millions of coffee trees within sight; we can see nothing else as far as our eyes can reach. The land is covered with a mantle of green, striped here and there with bands of brick red. The green mantle is the coffee trees, and the red marks out the roads. Look down at

the soil. It is the color of brick dust, and this color comes from the large amount of iron mixed with the other materials which it contains. The redder the soil, the better it is thought to be for coffee, although in some other parts of the world coffee is raised upon soil which is not red at all.

Now observe the trees. In the field where we are standing they look more like bushes than anything else. They are ten or twelve feet in height, and the branches grow out on all sides, from the ground to the top. They are planted in rows, and the long rows of green extend on and on until they lose themselves in the sky at the tops of the hills in the distance.

We take horses and ride through field after field. In some the trees are only as high as our knees, and in others they are three times as high as our heads. Here they are planting coffee. The forest has been cut down, and a gang of laborers is setting out the plants among the stumps. In the next field we find a score or more boys on their knees, pulling the weeds from about the young trees; and farther on men are plowing with mules which they direct carefully through the rows, turning up the red soil.

As we go, we observe that it takes a great deal of work to grow coffee trees. The beans are first sown in seed beds or nurseries. They soon sprout, and when they are a few inches high they are transplanted, each being set out in a little basin or hole, with sticks or leaves spread above it to protect it from the hot rays of the sun. The crop is frequently hoed and plowed to keep down the weeds; and this must be continued until the trees are four years old, when they will begin to bear fruit. After this they will

produce several pounds of beans every year; and in this rich coffee zone of southern Brazil a tree may continue to bear for thirty or even more years.

A great coffee plantation looks different from season to season. Down here south of the Equator spring comes while we in the temperate zone are having our autumn,

Picking coffee berries in Brazil.

and the coffee bushes begin to blossom in December. At this time the air is loaded with fragrance, and the hills are covered with white flowers, shining out through the green leaves.

Along in April or May the berries turn red, and the picking begins. The berries ripen at different times, and the harvesting lasts for weeks. During the harvest hundreds

of men, women, and children may be seen moving about through the bushes. Some are sitting down and picking or stripping the berries from the low branches, while others pull down and strip off those higher up. Sometimes a sheet is placed around the bottom of a tree and the berries are allowed to fall upon it.

After picking, the fruit is taken to the factory in different ways. On this plantation the most of it goes upon the railroad; but on others it is carried on mule back or in wagons, and sometimes it is floated down in long chutes, through which mountain streams have been conducted.

We follow one of the train loads to the factory and watch the coffee seeds taken out and prepared for the markets. The factory is a large building filled with machinery of different kinds for extracting the seeds; and near it are great fields paved with cement, on which the coffee beans are dried in the sun.

Let us look at some of the berries which have just come in from the fields. They look like red cherries and are almost as soft. We take up one and bite into it. The taste is not bad; and we chew away at it until the skin and pulp have separated from the two hard beans which lie within, their flat sides touching each other. We take the beans out of our mouths and look at them. They are white, and it is only when we cut off the outer envelopes or skins, in which each seed lies, that we find the hard green coffee beans of our grocery stores. Every bean has two skins; an outer one somewhat like parchment, and another within as thin as fine tissue paper. These skins must both be taken off before the beans can be sent to our markets.

The first process is getting rid of the pulp. The berries are run through machines which crush them without injuring the seeds, making a mush of the pulp and seeds. This mush is now carried over a long copper cylinder, in which are hundreds of holes, each just big enough for a coffee bean to pass through. As the mush passes over the

Coffee drying outside a Brazilian factory.

cylinder, the beans drop through the holes and are carried away by a little canal, into large vats. Here they are scoured clean by machinery, a great screw moving around among them and leaving them as white as snow.

The next process is drying, in order that the skins may be crushed and taken off. The white beans are spread upon the cement floors outside the factory and are left in

the sun for several weeks, until each is as dry as a bone. During this time they are stirred about with rakes, in order that they may dry evenly, and are covered up at night, so that they may not get wet.

The third process is the skinning. Every little bean has to have its clothes taken off. Its thick overcoat of parchment must be removed and the tissue-paper-like underclothes, sometimes called the silver skin, must be torn away, so that it may go in its olive-green nakedness to our markets. This undressing is done by machinery which breaks the skins, and by fanning mills which free the chaff from the beans, blowing it away while the beans flow off by themselves.

The cleaned coffee beans are of different sizes. Some are large and some small, some round and some almost flat. They must now be separated and graded before they are ready for shipment. This is done by passing them over sieves, so arranged that the grains are graded and run out through different pipes into bags ready to be shipped to the markets.

Coffee is usually sorted into varieties, as to character, size, and quality. These vary according to the soil in which the plants grow and also according to the parts of the plant from which the berries come. There are also different varieties of the coffee tree, such as the Arabian, the Liberian, and others, each of which has its own kind of fruit. There are certain grades known to the market; and some of the beans are shipped abroad as Mocha, some as Java, and some as Peaberry Rio, and others. The fact that a coffee bears the name of Mocha is no proof that it came from Arabia; and very little of the

coffee sold in our groceries as Java ever saw the island of Java in the Dutch East Indies.

Coffee is shipped in sacks, each of which holds one hundred and thirty-two pounds; and in this shape it is taken on the cars to Santos or to Rio de Janeiro, and there loaded upon steamers which carry it to the United States or to Europe.

In Java coffee trees are shaded.

Leaving Brazil, let us now take a look at some of the coffee regions of Java. The mountain slopes in many parts of that island are covered with coffee trees. Java lies near the Equator, and its climate is so hot that the trees need to be shaded. When the coffee is young, banana plants are used for this purpose, and, later on, larger trees, the leaves of which meet together overhead and shut out the hot sun. In some parts of the island there are estates where the best of machinery is used, much like the plantation we have visited in Brazil. In others the trees are in small orchards, each owned or rented by a family, who take care of them and gather the crop. The children aid

in the picking, the little brown boys and girls moving in and out of the green bushes, stripping off the red berries and carrying them home to be dried in the sun. After this, all unite in pounding the hulls off in wooden mortars, and in winnowing the chaff of skins and hulls by throwing it into the air. They carry the beans to the warehouses belonging to the government or to private parties and sell them for so much a pound.

The coffee soil of Java is usually of a chocolate-brown color, and some of it has a reddish tinge, like that of Brazil. Java is a land of volcanoes, and many of its volcanoes spout forth mud instead of stones. The mud contains rich fertilizing matter which, when dry, turns to a fine dust and enriches the soil. This dust is known as volcanic ash and is excellent for coffee. A somewhat similar soil is found on our coffee estates in Hawaii.

I have seen coffee trees growing luxuriantly in the southern part of our Philippine Islands. Here I also observed a process of coffee manufacture of an almost savage nature. It was on a little plantation on the island of Sulu, where the Moros were employed in harvesting the crop. The ripe berries had been brought in from the trees and handed to a score of Moro women and girls, each of whom had a large tin pan by her side. The berries were hulled by putting them in the mouth and chewing them until the pulp was free from the seeds. After this both pulp and seeds were dropped out into the pan, and later on the pulp was washed away from the seeds in a creek near by. The beans were dried in the sun, and the two skins taken off by pounding the beans with a wooden pestle, in a mortar dug out of the upright end of the log.

We raise excellent coffee in Porto Rico. Many of the mountainous parts of this island are covered with coffee trees; and every October there is a wealth of rich red coffee berries shining out of the green leaves. The picking season lasts several months; and our little Porto Rican cousins aid their parents in gathering the berries into baskets and in carrying them to the factory on their heads. Much of the coffee is harvested in the interior and taken to the ports on the backs of ponies, and not a little goes in great carts, hauled by oxen yoked up by their horns. Porto Rican coffee is carefully sorted after it reaches the ports. It is especially prized by the coffee drinkers of Europe and is yearly growing in favor in the United States.

The coffee, as it comes to us from the countries where it is raised, is in the raw olive-green beans which make the coffee of commerce. In this shape it is sold in all our grocery stores. Before it is used for drinking, the coffee must be roasted and ground. Many people do this at home, but there are also large establishments which make a business of roasting and grinding coffee, and the beans so roasted and ground are to be found almost everywhere.

42. TEA

LET us take a cup of tea with some of our friends in Japan, while we learn about a wonderful plant which furnishes a drink used by millions of people in many parts of the world. We are sitting in a tea house near Uji, on the edge of one of the best tea gardens of

the Japanese Empire. We took off our shoes upon entering, in order not to soil the soft white mats, and are now sitting with our hosts upon little cushions, flat on the floor. How delightful it is! The walls have been shoved back, and the air, fragrant with the odor of green tea leaves, blows through. We can almost pick the flowers which are blossoming outside the house; and that mountain stream flowing by seems to gurgle a welcome to us straight-eyed boys and girls from a far-away land.

Now a little Japanese waitress in a dark blue kimona and white foot mittens trots in with some tiny blue cups on a tray. She first salutes us by getting down on her knees and sucking in her breath, as she bows her head to the floor. She then hands each of us a cup of steaming straw-colored liquor which has a delicious aroma. It is the best of Japanese tea. We drink it slowly, native fashion, taking three long sips and a short one, sucking in our breath loudly as we do so. The more noise we make in drinking, the better our host will be pleased; for this shows that we appreciate the quality of the tea and like it.

Tea has been used in Japan and China for ages; and the people of these countries drink more tea to-day than all the rest of the world put together. The amount consumed by them in one year has been estimated at more than two thousand million pounds, which is about three times as much as is used by the people of Europe, North America, and other tea-drinking countries. The British, whether at home in England, Ireland, or Scotland, or abroad in Australia, South Africa, or Canada, are the chief tea drinkers of the white race. They consume from

four to eight pounds a year for each person, while the people of the United States and of the other countries of Europe each drink on the average only one pound or less. The Russians are especially fond of tea; every well-to-do family keeps a samovar of boiling water ready for making it. The samovar is a metal urn with a central tube in which live charcoal is placed. They usually serve tea in tumblers, without milk, flavoring it with a slice of lemon; and many of them, in drinking it, put a lump of loaf sugar between the teeth and suck the tea through it. In many English homes tea is served every afternoon and often instead of coffee for breakfast. Here in Japan it is offered us the moment we enter a house; and the natives seem to be drinking it from morning until night.

Where does tea come from? It is from the evergreen leaves of bushes, such as we see on all sides in the gardens about us. The bushes are from three to five feet in height, and the leaves resemble those of a rose bush or a willow tree. It is from the young tender light green leaves which those women and children are picking that the best tea is made. Notice how they move about among the bushes, plucking off leaf after leaf and putting the leaves in baskets. They are careful which leaves they pick and try to get all the young ones. There are some girls who have filled their baskets and are carrying them to the tea factory, where the leaves will be dried and will then become the little twisted-up tea of our grocery stores.

The tea plant belongs to the same family as the camellia. It is a native of subtropical Asia and grows wild on the slopes of the Himalaya Mountains. It has

been cultivated for hundreds of years in Japan and China; but only within the last century has it been grown commercially in India, Ceylon, and Java, from where more than half the tea exported now comes. The wild plants grow to a height of fifteen or more feet, but the cultivated ones are trimmed back and are usually kept

Japanese women and children picking tea.

only three, four, or five feet in height. Tea plants are quite hardy, and it is believed that they can be grown in parts of our Southern States. Indeed, a successful plantation has been established in South Carolina.

In growing tea, the seeds are sown in nurseries or in the gardens themselves. The plants are set out so close together that fifteen hundred or more can be grown on an

acre. They require a rich soil and must be cultivated and weeded until they are three years old, when the leaves are first plucked for tea. They produce more leaves as they grow older. After the first picking the tea is gathered several times every season, the limbs being trimmed off from time to time, so that the bush, although only a few feet in height, grows after a while quite a thick trunk. In some localities the bushes are cut down to the ground every ten years and new ones are allowed to sprout from the stumps.

The best tea comes from the young leaves and the buds just ready to open. In Japan there are three pickings every year, and in some parts of China, four. The first is in April, when the buds have just unfolded and are covered with fine silky hair. The second is in May or June, and the third and fourth later on. As the summer wanes, the leaves lose in quality, and, although only the tenderest are taken, those picked last make very poor tea.

Tea varies also in flavor, according to the soil and locality in which it is grown. Some of the choicest tea is so valuable to the Chinese and the Japanese that it is seldom exported. I have tasted tea in Canton, in southern China, which the merchants there told me was worth twenty dollars a pound; and teas are grown in Japan, the first pickings of which bring five times as much there as any tea sold in our markets.

In Japan and China most of the tea is raised in small gardens, although there are parts of each country where the little tea farms all together cover many acres, the green bushes extending on and on for long distances in every direction. In the regions south of the Yangtse River

there are thousands of porters who carry the tea on their backs to the markets. In India, Ceylon, and Java the tea is raised on large estates, some of which employ hundreds of hands. The Sinagar tea plantation, which I visited in Java, was then producing more than a million pounds of the finest tea every year; and it had, in some seasons, as many as three thousand women and girls picking tea. They were paid less than half a cent each for every pound of leaves, and the best pickers could make only a few cents a day. It takes several pounds of tea leaves to make a pound of tea, and a single bush seldom yields more than one pound of leaves each year.

The Sinagar estate had great factories in which the tea was cured by machinery. The leaves were first spread out on the floor to wilt and were then put into rolling machines, by which they were rubbed about over tables, so that they lost their flat shape and came out looking more like little green worms than anything else. They were next put through a process of fermentation and then dried by hot blasts and revolving fans, after which they were ready to be packed up into lead lined, damp proof boxes, for export to all parts of the world.

Here in Japan and also in China most of the tea is cured by hand. There are two ways of doing this, according as green or black tea is desired. In making green tea, the fresh leaves are roasted in pans or steamed for a short time immediately after they are gathered. They are now rolled with the bare hand upon a table and are then taken back and again roasted in ovens for an hour or more. As the roasting goes on, they are stirred and rolled about; and, when they come out, they are of a dark

green color, which grows lighter after a time. The roasting is done without fermentation.

In curing black teas, the leaves are first exposed to the sun on circular trays. During this time they ferment, wilt, and become limp and spotted with red or brown, giving out a peculiar odor. The workmen watch the tea and, when the odor is just right, gather it up in baskets

Sorting tea.

and spread it out on a long table, where men and women roll it over and over for about thirty minutes and then pack it tightly in large round baskets, where it again ferments. It is now poured out on the tables and again rolled, and then roasted on iron gauze sieves over charcoal fires. During the roasting the color turns black.

After leaving the roasting or firing rooms the tea is sorted and all the seeds, stalks, and rubbish are picked out.

The leaves are then ready to be shipped to the ports, whence they go to the markets. At the ports some teas are again roasted and sorted; so that the tea for a single cup passes through many hands.

The chief of the black teas known to commerce are the following, beginning with the finest: Flowery Pekoe, Orange Pekoe, Pekoe, Suchong, Oolong, Congou, and Bohio. The chief green teas are: Gunpowder, Imperial, Hyson, Young Hyson, and Hyson skin. Teas are also classed according to the provinces whence they come, and in other ways. The Formosa teas are especially fine, as are also some from Ceylon and from India. In curing tea, the leaves are often mixed with certain flowers for a time to give them a fragrant odor. In China and Japan green teas are sometimes colored with indigo, Prussian blue, and other materials. The Chinese call colored teas "lie teas."

Brick tea.

There is another form in which tea is largely exported to Russia. This is brick tea. In making it, the leaves are ground up and steamed until they are soft and mushy. They are then put into molds of about the size of a brick and pressed into shape. When they come out they are as hard as so much pressed clay, and the tea in them will keep fresh for a long time. The choice leaves are made into smaller bricks which look

much like the little cakes of chocolate that are sold in our stores. Brick tea is packed up in boxes of the right size to be carried by camels, in caravans, across Asia to Russia. One of the chief places at which this tea is manufactured is Hankow; and it can now be taken thence by rail to Pekin and over the Trans-Siberian Railroad through Russia to all parts of Europe.

Brick tea is largely used in Tibet and Mongolia. The natives there make a soup of tea, butter, and salt mixed with water, to which a thick cream is added. The Mongols prize the bricks so much that they sometimes use them as money, each brick passing for the value of about fifteen cents.

The tea importers of Europe and America have their buyers in the tea-growing countries. These men pick out the best teas. They must be able to tell good from bad tea before purchasing. They examine, smell, and taste the samples of tea, each made from a different kind of leaf, and can tell just how much each kind is worth.

Most of the teas are packed for export in wooden chests which are lined with sheet lead to keep out the moisture. A great strife prevails among the tea steamers as to which shall get its cargo first to the markets. After loading, the ships start from China and Japan on their long race down to Singapore and across the Indian Ocean to the Suez Canal, and on through the Mediterranean to Europe. Their arrival is eagerly awaited, and the tea that comes in first brings the highest price. A large part of our tea is brought by fast ships across the Pacific, being landed at either Seattle or Vancouver, whence it is sent by rail to all parts of our country.

43. CACAO—CHOCOLATE AND COCOA

WHEN the Spaniards, commanded by Hernando Cortez, conquered Mexico, they found the natives using a drink made from the ground-up seeds of a fruit that grew on a tree. The Emperor Montezuma was so fond of it that he had some made for him daily, and about two thousand jars for his household. The drink was served to him smoking hot, in golden goblets; and he sipped it from spoons of fine tortoise shell. The seeds of this tree were so valued by the Aztecs that they used them as money; and a good double handful, in some localities, was the price of a slave. Pizarro found the Incas using the same drink in Peru; and his soldiers, as those of Cortez, tried the beverage and liked it. They carried the seeds of the tree back to Spain; and from there the knowledge of the new drink gradually spread, until it was known throughout Europe, and the seeds became an important article of commerce.

This drink was chocolate, and the tree from which the seeds came was the cacao tree, which is now commercially grown in many tropical parts of the world. It is a native of Central and South America, and it was cultivated by the Indians long before white men crossed the Atlantic. It is now raised largely, not only in Mexico, Central America, and the West Indies, but also in Ecuador, Colombia, Venezuela, and Brazil. It has been taken to the islands and countries along the Gulf of Guinea in Africa, to southeastern Asia, to the Philippines, Hawaii, Java, and even to Samoa and the other islands of the South Seas.

The world's demand for cacao has become so great that several hundred million pounds of it are annually exported to the various markets, and every nation of Christendom delights in it as a drink and also in candies, cakes, and puddings.

Javanese women sorting cacao.

What is more delicious than a cup of sweet chocolate for breakfast? And how our mouths water when we think of chocolate caramels, creams, or the little cubes of sweet chocolate made in different ways. The use of chocolate is steadily increasing in our country and also in many other parts of the world. For a long time the Spaniards consumed more than any other nation. They were the first to know the secrets of chocolate manufacture, and they held, for a time, the monopoly of the trade. Now almost every one understands how to make chocolate, and we ourselves import more cacao seeds than any other nation. The drink is used throughout Europe; and the Germans, French, British, and Dutch now each consume far more of it than the Spaniards.

The cacao tree is an evergreen which seldom grows

more than fifteen or twenty feet high and which in cultivation is often kept lower by trimming. The tree has large glossy leaves which grow chiefly on the ends of the branches, but sometimes on the trunk. It has small pinkish white blossoms on the trunk and the main branches. Its fruit when ripe is somewhat like a cucumber in shape and is six or eight, or even more, inches long and sometimes six inches thick, and grows upon short stems on the trunk or the branches. The ripe fruit has a thick hard warty skin inclosing a sweet pulp, in which are many reddish brown seeds, — the cacao beans of commerce. There are from twenty to thirty, and sometimes even forty, of these seeds in one fruit; and they lie in five cells, each cell filled with this soft pink or white pulp. The seeds are about as big as sweet almonds, only a little thicker. Each seed consists of a shell containing a dark brown kernel, which is more than half oil. From this kernel our chocolate is made.

Cacao.

In raising cacao trees, the seeds are first planted in nurseries or out in the fields. They sprout quickly and soon grow a foot or more high. They are now transplanted, about two hundred and fifty to the acre, in fields shaded with bananas and are carefully weeded until they are

four or five years old, when they begin to bear fruit. They are in full bearing at about the eighth year, when a good tree will yield about eight thousand seeds, and they continue to bear for many years.

In Venezuela, which is one of the most important of the cacao-growing countries, the fruit is harvested twice a

Cacao harvester at work.

year. It is cut from the trees, the pods on the higher branches being chopped off with sharp knives fastened to long poles and the fruit caught as it falls. In some countries the seeds are at once removed and washed, but in others they are covered up and allowed to ferment in vessels, in heaps on the ground or in holes under it, until the pulp decays. After this the beans, or seeds, are taken

out, dried in the sun, and shipped in bags to the markets. The ordinary yield of a tree is two or three pounds of seeds per year, although some trees produce much more, a good crop being five or six hundred pounds to the acre.

After the cacao beans have reached the markets, they have yet a number of processes to go through before they become chocolate or cocoa. These are performed in great factories filled with modern machinery. Here the beans are first cleansed of dust and other stuff. They are then roasted in large revolving cylinders in which they are moved over hot pipes for several hours. They are next crushed to get out the kernels, the shells and dust being taken away by an air blast to be treated separately and sold under the name of cacao shells.

It is from the crushed kernels, freed from the shells, that the real chocolate comes. These are put into mills, through hoppers above, and are ground into a fine smooth paste which flows out somewhat like thick molasses. It is run off into molds, in which it soon hardens, and it is then ready to be packed up for sale to our grocery stores. In making sweet chocolate, sugar is added before it is molded; and, for vanilla chocolate, some vanilla extract, or finely ground vanilla beans.

Cacao nibs, or the broken pieces of the beans after the shell is removed, are sometimes used to make chocolate or cocoa. An essence of cocoa is also made from them, which can be used by pouring boiling water upon it. In the manufacture of chocolate and cocoa, a large part of the fat is removed and placed upon the market as cocoa butter, to be used for medicinal purposes.

In addition to tea, coffee, and cacao, there are other plants and trees which furnish stimulants or drinks in different parts of the world. The coca plant is chewed by the Indians of Bolivia and of Peru. It is a shrub which grows four or five feet high, with leaves that look like those of our wintergreen. The leaves are stimulating, and many of the Indians chew them all day long. It is from this shrub that cocaine is made.

In southeastern Asia and the islands about the people chew the leaves of the betel pepper, which they mix with lime and bits of areca nuts; and in Africa the nuts of the kola tree are chewed for their invigorating properties.

In Paraguay, Uruguay, Argentina, and Brazil the people make a tea called yerba maté, from the leaves of a species of wild holly, found in Paraguay and Brazil. The plant is also cultivated. The branches are cut off and the leaves are woven in and over them, as a thatch over a framework. Beneath this a fire is built and is kept burning until the leaves are perfectly dry. They are then taken down and pounded with flat wooden clubs to a coarse powder, which is packed up in rawhide bales for the markets. More than a million dollars' worth of such bales are sold every year.

In preparing maté for use, a spoonful of powder is put into a bowl, hot water is poured on, and after a short time a tea is formed, which is sucked up through a tube. This tea is very refreshing when one is tired. Many South Americans use it for their early breakfast, and it is said that the cowboys of Argentina can gallop all day on horseback without eating, if they have a good cup of maté before they start out.

44. TOBACCO

TOBACCO is not a food plant, but it is so largely used and so important to commerce and industry that we must learn something about it. It was not known until the discovery of America; and one of the most wonderful stories which the Spaniards who went with Columbus told upon their return to Europe was how the Indians ate fire and breathed the smoke from their nostrils. Many of these Spaniards had learned to smoke tobacco, as the Indians did, and after a while the custom was introduced into Europe and became fashionable among the ladies and gentlemen of the time. Tobacco leaves were first carried from Santo Domingo to Spain in 1559, and, a few years later, some were taken by Sir Francis Drake from Virginia to England. Sir Walter Raleigh then started the fashion of pipe smoking at the court of Queen Elizabeth. Shortly after this tobacco began to spread over the world, and it is now used in some form or other in almost every part of it.

As for ourselves, we think man is better off without tobacco; and this was the opinion of many at the time it began to be used. It was then denounced as injurious; and James I of England described smoking as "loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in its black fumes, nearest resembling the Stygian smoke of the pit that is bottomless." Some of the popes of those days declared against smoking, and a Sultan of Turkey made tobacco using a crime.

Notwithstanding all this, the evil custom steadily grew,

and the demand for tobacco became great. Plantations were set out in Virginia and Maryland, and, for a long time,

Tobacco field in Virginia.

most of the wealth of those colonies came from them. The crop was so valuable that taxes were paid in tobacco, and it was used as money. Some young women were once sent across the Atlantic Ocean from England to the colonies, to be chosen by the settlers as wives; and each groom paid for his bride's passage between one hundred and twenty and one hundred and fifty pounds of tobacco.

For a long time Maryland and Virginia were our only tobacco producers. A little later tobacco was planted in Pennsylvania and in other parts of the north, and it is now grown in almost every one of the United States, although,

on a large scale, in comparatively few. Our chief tobacco States are Kentucky, North Carolina, Virginia, Ohio, and Tennessee; and our crop all together is so large that it could furnish more than ten pounds to every man, woman, and child of us.

The cultivation of the tobacco plant has long been extended to other countries; and it is now grown on all the continents and on many islands of the seas. It is one of the chief products of the West Indies, some of the finest tobacco of the world being grown in Cuba and Porto Rico. Excellent varieties are also produced in Sumatra, Java,

Making cigars in a Manila factory.

and the Philippine Islands. The United States, however, grows more tobacco than any other country; and we export vast quantities of it, sending some to almost every part of the world. Our chief exports go to Germany, England, France, Austria, and Holland.

We use a large amount of it at home; and, as this lux-

ury is heavily taxed, those who smoke, chew, or snuff, aid greatly in paying the expenses of our government, our tobacco revenue amounting to many million dollars a year.

The quality of tobacco depends largely upon the soil, climate, and method of cultivation. Different soils produce different tobaccoes, and some tobaccoes will grow better in certain localities than in others. There is a region in western Cuba from which come the finest cigars; and the tobaccoes of Sumatra and of Connecticut are especially valued for their thin, silky leaves, from which cigar wrappers are made. Other localities produce the tobacco which is used inside the wrappers; and some are especially noted for their fine smoking tobaccoes, cigarette tobaccoes, and tobaccoes for chewing and for snuffing.

The tobacco plant grows from three to five feet in height, and often much taller. Its leaves have some resemblance to cabbage leaves; but they are longer and thinner and of a dark green color. The plants are grown from the seeds, and when one looks at them he would naturally think that the seeds must be large. They are, on the contrary, about the smallest of all seeds. The tobacco seed is not bigger than the point of a pin, and any of us could, I venture to say, hold a hundred thousand of them in one hand. A single plant will grow more than half a million seeds, or enough to plant about one hundred acres of tobacco.

In setting out a tobacco plantation, the first thing is to make a plant bed in which the seeds can be sprouted. In the United States this is often done by covering a piece of ground with wood and burning the wood, so that all the insects, vegetable matter, and other seeds in the ground are

cooked out. After this the bed is manured and the tobacco seeds are sown. A wide sheet of very thin cloth is now stretched over the bed to hold in the heat and to keep out the insects. In a short time the little seeds swell and sprout, and the baby plants push their heads through the soil. They first look like cabbage plants, and they are soon ready to be taken up and set out in the fields. They are usually planted in hills at about four thousand plants to the acre. This is done in the spring. They are carefully cultivated throughout the summer and are harvested in the fall.

As the tobacco ripens, the leaves become yellow, and the tobacco farmers then cut off the stalks close to the earth and hang them on sticks stuck in the ground. In some places they strip the leaves from the stalks and string them on wires.

After the leaves are gathered, they must be dried and cured. In some tobacco regions this is done by hanging the leaves in sheds and allowing the air to pass through them. In others they are cured in tobacco barns heated by flues or pipes, so that the moisture is gradually driven out, the barns being kept hot day and night during the process. When the leaves are cured, they are tied up in bundles and packed into bales for shipment.

In addition to this, the tobacco must go through various other processes in the factories before it can be used. The leaves are stripped from the stems which run through them and then prepared in different ways to be used as cigars, cigarettes, or as tobacco for pipe smoking, as chewing tobacco, or as snuff.

At the present time some of our choice tobaccoes are

grown under cover. The plants are set out under great tents, acre after acre being covered with cloth to protect them from the hot sun and strong winds and to give them

Our choice tobaccoes are grown under cover.

the same temperature as in the tropics. There are many such tent farms in Connecticut and in Florida, and also in the choicest tobacco lands of the Vuelta Abajo region of Cuba.

45. WHERE THE SUGAR CANE GROWS

TO-DAY we shall take a peep into the world's big sugar bowl and then visit some of the countries which fill it. Sugar is found to some extent in almost every plant that is used for food, and most largely in sugar cane and in beets. Grape sugar comes from fruit,

palm sugar from the juice of the palm, maple sugar from the sap of the maple tree, and milk sugar from cow's milk. The chief commercial sugars are from sugar cane and from beets; and a larger amount of sugar is now made from beets than from cane.

For a long time cane sugar was the only variety known to commerce. This originated in southern Asia and was made in China several thousand years before it was brought into Europe. The early Egyptians and Greeks used honey for sweetening, and when sugar was first carried to Europe, it was so costly that it was bought only as medicine or as a luxury by the very rich.

It was not until the Crusades that sugar cane was grown outside of Asia. It was carried first to northern Africa and later on to the Madeiras and the Canaries, which islands, for a long time, supplied enough for the European market. Then the New World was discovered, and the cane was introduced into the West Indies. Its cultivation spread to South America, and it is now grown here and there throughout the tropical world.

Beet sugar, which comes from the temperate zones, is a much more recent production. Marggraf, a German chemist, first discovered it in 1747, and about 1801 a pupil of his, named Achard, erected the first beet sugar factory. At that time Napoleon Bonaparte was at war with England, and the ports of France were so blockaded that the French could not get sugar. Napoleon then decided to raise sugar at home, and he offered a prize of one hundred thousand francs to any one who could make a success of extracting sugar from beets.

Later, both the French and the German governments

paid bounties of so much a pound on all sugar made from beets in their respective countries, and in time a great beet industry grew up. Other countries did likewise; and to-day beets are grown for sugar not only in Europe, but in many parts of the United States. In 1840 only five per cent of our sugar came from this source, while more than ninety per cent of it came from cane; but now the greater part of it is beet sugar.

In the meantime the world's sugar production has been steadily increasing. In 1840 it amounted to a little more than one million tons, whereas it is now about twelve millions. Of this about five twelfths comes from cane, and seven twelfths from beets.

The use of sugar in the United States is rapidly increasing. When our parents were children the people ate only about one third as much as they eat at present. We are now annually consuming more than twice as much sugar as the whole world did in 1840; we eat an average of seventy-five pounds the year through for each person in the United States, or a pound and a half every week. Sugar is largely a luxury, and only those nations which are well-to-do can eat much of it. We Americans are among the richest of the world's peoples. We eat more than twice as much sugar as the Germans or the French, and several times as much as any other nation of Europe except the British, whose per capita consumption is greatly increased by the large amount they use in making jellies and jams for export.

Our sugar costs us more than our coffee or tea or any other article of food that we buy from abroad. At five cents a pound, the seventy-five pounds of sugar which each of us

annually uses costs three dollars and seventy-five cents; whereas the barrel of flour which we each use in one year costs only five or six dollars; so that we pay more than half as much for sugar as for bread. Moreover, we raise our own wheat; whereas, the most of our sugar is imported, and we often pay out in one year, to other nations, as much as one hundred million dollars for it.

Now let us take a flying trip southward to the land where the sugar cane grows. The greater part of the sugar cane raised in the United States comes from Louisiana, and the country for miles about the low moist delta of the Mississippi River is covered with sugar plantations. We also get a great deal of sugar cane in Porto Rico and in the Philippine Islands; and, in the Hawaiian Islands, we have some of the largest, best, and most profitable sugar estates of the world. The sugar lands of Hawaii lie along the coast and on the lower slopes of the mountains. They are mostly owned by companies with large capital and are worked by thousands of natives or Asiatics under white overseers and managers. Most of the hard labor is done by Japanese and Chinese men and women, who have little villages on the estates, where they live much as they do in their homes on the other side of the Pacific.

Many of these plantations are irrigated, and on some the water is brought from the mountains, through wooden troughs many miles long. On others it is pumped great distances, and the expense of getting it to all parts of the plantations is enormous. The larger establishments have railroads which carry the cane to the mills and steam plows to cultivate the soil.

How beautiful it is! We ride on the cars through walls

of bright green stalks which grow upward to a height of ten or twelve feet, looking from the car windows like a solid mass of green. The stalks remind us of those of Indian corn, save that they are much taller and have many more leaves than the cornstalks. The canes grow more closely together, and the long stalks bend this way and

Planting sugar cane in the Hawaiian Islands.

that, so that it is almost impossible to make one's way through the rows.

At one place we watch them planting the cane. The land has been plowed, and great furrows, seven feet apart, have been run from one side of the field to the other. Then stalks of fresh sugar cane, trimmed and topped, are laid horizontally, three abreast in the rows, the pieces overlapping each other so that each furrow has, as it were, three

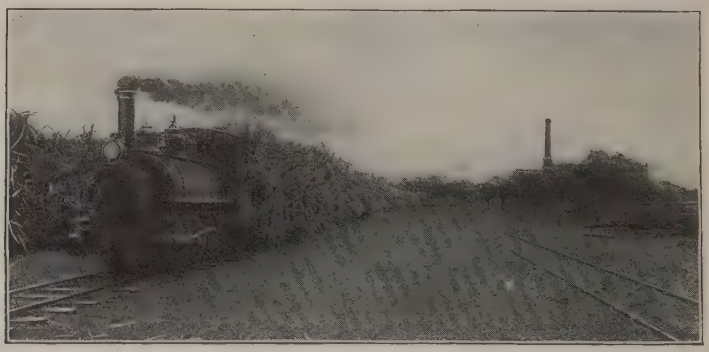
long pipes of cane running from one end of it to the other. Each piece of cane has joints like a cornstalk, and at each joint there is a little eye, much like that of a potato. The soil is thrown over the furrows to cover the cane, and after a short time each of these little eyes bursts out into a sprout, which makes its way up through the ground, looking just like Indian corn when it first comes through the soil.

The cane grows rapidly. It is plowed, and the weeds are kept out. By August the plants are taller than a man, and

West Indians cutting sugar cane.

they continue to grow until the middle of October, when they are ready to be cut for sugar. After they have been cut new canes will sprout up from the stumps and give a second or a third crop; while in some countries, such as Cuba, the stalks will sprout again and again, yielding sugar for fifteen or even more years.

As we ride onward through the plantation, we can see the smoke rising from the great sugar mills, scattered here and there over the landscape; and we now and then pass an estate where they are loading the cane upon the cars which take it to the mills. There are scores of men and women at work. Each has a long knife like a corncutter in his hand, and this flashes in the sunlight, as he chops his way through the green wall. The cane falls, stalk by stalk, as the workers move onward. The men seem to know just how many strokes to use, so that not a motion is wasted. They cut the cane close to the ground, for the most juice is found near the bottom of the stalk; and strip off the tops and the leaves, from which very little sugar can be made. The cut stalks are thrown into piles, or windrows,

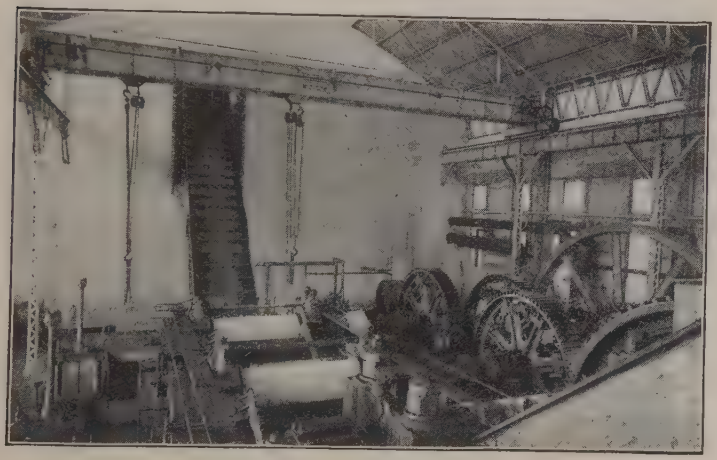


A sugar train going to the mill.

where they are gathered up by those carts which are coming in now, and are taken to the cars. This plantation has many miles of railroad upon it, and the little engines puff and blow, as they pull the heavy cane to the mills.

Our next experience is in the great sugar mills them-

selves. We have ridden in on a train load of cane and have watched the men throw it off upon a moving belt, or roadway, which carries it to the top of the great building and drops it down upon the heavy iron rollers which squeeze the juice out. These rollers are so arranged that the pressure between them is enormous. Each is as big around as a hogshead and very much longer. They have teeth like



Interior of a crushing mill.

an enormous file, which catch the cane and crush it, while the weight makes the juice flow out in a stream. The crushed cane goes from one series of rollers to another, and at the end it is as dry as a bone. Indeed, it is so dry that it forms excellent fuel. It is carried by a moving belt from the rollers and dropped into the furnaces. Here, as fuel, it makes the steam which is to squeeze the juice from the stalks yet to come.

We now go around under the rollers and examine the

juice. It is pouring down from the squeezed stalks and flowing off in a trough about a foot wide. It has bubbles on top and looks sloppy. It reminds one of dishwater and is so sweet that the taste sickens us. And still it is out of this dirty water that the pure white sugar must come. The dirt and all the impurities will, however, be taken out; and it will be as clear as crystal before it is boiled down into sugar.

The water is first bleached by running it into large iron tanks through which flow streams of sulphur gas. This process makes it bubble; and a yellow foam which rises to the top is skimmed off. Lime is next put into the tank to settle the dirt. After several other processes, the juice, which has been skimmed again and again, is ready for boiling. This is done in huge copper vats heated by coils of steam pipes. The liquid flows from one vat to another, growing clearer and clearer and thicker and thicker, until it finally becomes a dense mass of sugar crystals mixed with molasses. It looks now, for all the world, like brown mush.

The next process is to get the sugar out of the molasses. For this purpose cylindrical metal vessels are used, which have walls of gauze so finely made that the molasses will go through the meshes, but the sugar crystals will remain inside. In each vessel there is a shaft which is moved round by machinery at the rate of a thousand or more revolutions a minute. This throws the sirup against the walls and forces it through the meshes. At first the walls look brown; but as the shaft continues to turn, more and more of the sirup flies out, and they grow paler and paler, until nothing but sugar is left. The walls now look as

though they were covered with snow; but they are really coated with the purest white sugar, as we can see when the shaft stops moving and the sugar is scraped off, to be carried away and packed up for the market. In many mills the molasses which is thus thrown out is boiled again and again to make second and third rate sugars.

Such molasses is not like the sirup sold for table use. This is made from the fine juice of the cane. The refuse molasses is so cheap that it does not pay to put it in barrels, and it is often carried to the markets in tank cars and sold in bulk for cattle food and for use in certain manufactures.

The principal sugar cane countries of the world are Cuba and Java, each yielding a million or so tons of sugar every year. After them come Hawaii, Louisiana, Brazil, Peru, several of the West Indies, Mauritius, Queensland, Argentine, and the Philippines. The product from the several countries varies according to the seasons, but, as a rule, Cuba produces far more cane sugar than any other part of the world. Sugar cane is now being grown in nearly every province of Cuba, and about half the land cultivated is devoted to that crop.

In many of these countries the methods of raising cane and of extracting the juice are much more rude than those we have seen. A large part of our Philippine sugar is ground by buffaloes or in water mills, and the product goes to the market in a raw or brown state, so that it must then be refined and turned into white sugar before it can be sold. Much of the Cuban product is sold as raw sugar, and this is also the case in others of the great sugar cane lands.

46. BEET SUGAR, MAPLE SUGAR, AND HONEY

WE have already learned that in some years the United States pays out more money for sugar than for any other import. In 1905 the sum thus spent was almost one hundred million dollars, or more than one dollar for every man, woman, and child in our country. Is it not a pity that we do not raise this sugar at home and thereby keep this vast sum in our own pockets?

As long as sugar was produced from cane only, such a thing was impossible. Cane must have a rich moist soil and a warm climate. It thrives best in the tropics and sub-tropics, and we have only a small area in our Southern States where it can be profitably grown. There are some sugar cane plantations in Porto Rico, Hawaii, and the Philippines; but they are far away, and their whole product could not begin to satisfy Uncle Sam's sweet tooth. It is different with sugar that is made from beets. This vegetable grows best in the North Temperate Zone; and our country has such vast areas in which it would thrive that many people believe we shall, at some future time, produce all the sugar we use. There is a belt of beet sugar land about two hundred miles wide which extends from Delaware to Massachusetts, and runs irregularly across the United States, taking in lower New England and parts of New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Minnesota, Nebraska, and North and South Dakota, and extends westward almost to the Rocky Mountains. At that point the belt

drops and sweeps over a great part of Colorado, New Mexico, and Arizona; after which it widens and moves northward, including all of California and the most of Utah, Nevada, Idaho, Washington, and Oregon. Sugar beets can be grown elsewhere on our continent; but in this belt they produce so abundantly that, if the plants were set out over even a small part of it, we might be exporting sugar, rather than importing it.

We are already producing several hundred million pounds of beet sugar every year, and we have great factories where the juice of the beets is made into sugar. There are large tracts in Colorado, Michigan, California, Utah, Nebraska, and Wisconsin which are annually planted in sugar beets; and our beet farms are rapidly increasing in number and in size in many other parts of the belt.

There is no difference in the taste of beet sugar and of cane sugar; one is every bit as sweet and as good as the other. The juice of each plant contains similar crystals, and they are reduced to sugar in much the same way. Of the twelve million tons of sugar now sold in the world's markets, about seven millions come from beets and five millions from cane. These beets are grown in lands which formerly imported cane sugar, and most abundantly in Germany, Russia, Austria, France, Belgium, and Holland. Germany produces more sugar than any other country, and its sugar is made altogether from beets.

The sugar beet is not unlike the common beet of our gardens. It is usually white, and the best varieties contain a great deal of juice, from which sugar is made. In raising beets, the ground must first be deeply plowed and well harrowed, and then laid off in rows about eighteen inches

apart. The beets are planted from the seed, and some farmers have drills which drop several rows at one time.

Sugar beets.

When the plants come up, they are thinned out so that they stand six or eight inches apart in the rows. They are well cultivated and are kept free from weeds, and within about five months after planting are ready to be made into sugar. Each beet should then be about eighteen inches long, four or five inches thick at the top, and should weigh a pound and a half. If the beets are of a good quality, they should contain about fifteen per cent of sugar, so that seven or eight good-sized ones would yield one pound. Good land will often produce twelve tons of beets to the acre, and these, when run through the mill, should yield almost two tons of sugar.

In preparing the beets for the mill, they are dug up and the leaves are cut off. They are then carried by little

Preparing sugar beets for the mill.

canals into washing machines, where, by revolving brushes, every particle of soil and dirt is removed. After this they go on into the slicers, to be cut into V-shaped pieces about the length and thickness of a slate pencil, called cossettes. The cossettes are dropped into the large iron tanks of the diffusion batteries, which are so arranged that the beets move about through them from one tank to the other. Each tank is filled with warm water, and the machinery is so constructed that as the cossettes pass through it, a part of the sugar in them goes out into the water. More and more is extracted in each tank and at the end of the process almost all the sugar has gone into the water, which is now a dirty liquid, almost as black as ink. The refuse or pulp is carried off by machinery into vats outside, where it is used for feeding stock.

The inky liquid contains all the beet juice, and, like that of the cane, it must be purified before being boiled down to sugar. It is first run into great tanks, kept hot by steam pipes. Lime is put in to precipitate the dirt, carbonic acid is introduced, and by various processes the water is made as clear as crystal. It is now ready for boiling. This is done in great tanks filled with steam pipes. As the liquid passes from one tank to the other, it grows thicker and thicker, turning first to a sirup and then to a mixture of sugar and molasses, like that we saw in our sugar cane mill. The molasses is removed just as in making cane sugar, and at the end we have the sweet white grains we use on our tables.

There is another sugar made in the northern part of the United States from the boiled-down sap of the maple tree. The amount of this sugar is not large, in comparison with that made from either cane or beets, being all together about twenty-five million pounds a year. More of this is produced in Vermont, New York, and Pennsylvania than anywhere else. Ohio makes some maple molasses, but it does not compare with those states in the production of sugar.

Our cane and beet sugars are harvested in the fall; the maple sugar season is in the early spring, when the sap begins to flow. At this time the sugar farmers bore holes in the trees, not far from the ground, and drive little spouts into them. In a short while the clear white sugar water flows out, drop by drop, and is caught in little buckets that are hung on the spouts. When the buckets are filled, which is perhaps once or twice a day, they are carried to the sugar house, and the sap is put in large kettles or vats to be boiled.

As the boiling goes on, the water grows thicker and thicker. It turns first to a light yellow, then darker; then

Gathering sap in a maple sugar camp in Vermont.

it becomes a molasses, and finally, a thick sirup. It is now poured off into molds and left to harden into sugar. The molasses for table use is taken from the fire at an earlier period during the boiling and is put up in jugs or in bottles to be shipped to the markets.

Maple sugar making is often done while the snow is yet deep on the ground; and at such times the sugar water may be carried to the house in buckets, by men or boys upon snowshoes, or in great tubs or barrels, on sleds drawn by horses.

In addition to our sugars from the juices of cane, beets,

and trees, we have myriads of honeybees, which rob the flowers for our tables. We eat more than sixty million pounds of honey a year; and we have several million people who keep bees and sell honey and wax. The most of our honey comes from the North Central States, although more or less of it is made in every part of the Union. Texas produces the most; and then come California, New York, Missouri, and Illinois, each of which yields several million pounds per annum.

Honey varies in quality and in flavor, according to the plants from which it is taken. That from buckwheat, for instance, is dark and strong, and is not so much relished as is the clear white honey that comes from sweet clover.

In gathering honey, the bee puts the sweet substance extracted from the flowers into a little bag it has inside

Beehives in California.

its body. The nectar changes somewhat on the way to the hive. It also changes inside the hive; so that the

honey we eat is not exactly the same as that the bees suck from the flowers. The wax, or comb, in which the honey is stored, is made by the bees from the honey they eat; and it is said that eighteen or twenty pounds of honey are required to make one pound of fine white comb. For this reason many bee keepers take the full combs from the hive and put them into machines which whirl them about, throwing all the pure honey out of the cells. The combs can then be again placed in the hive; and, if the season is good, the bees will rapidly refill them.

Honey is sold in our markets, both in the comb and strained. The best way to buy it is in the comb; for strained or extracted honey is sometimes adulterated with cane sugar or with glucose.

47. SALT

ALL the foods we have so far examined belong to either the vegetable or the animal kingdom. We have one food which belongs to the mineral kingdom. This is salt, which is found in sea water and salt springs and in great rocky deposits, down under the ground. Salt is so necessary to man that it early became an article of commerce. It was one of the commercial products of ancient Venice, whose people evaporated it from the waters about the marshy islands upon which their city is built. It is mentioned many times in the Bible, and it was used by the Egyptians, Greeks, and Romans. The poet Homer referred to it in describing the repasts of his heroes, and the soldiers of old Rome considered it an important part

of their rations. Indeed, the word "salary" comes from salt, and to-day when we speak of a boy or man as good for nothing we say he is not worth his salt.

Almost every nation has some superstition or other connected with this article. The Hungarian peasants sprinkle it on the doorsteps of a new house to keep out evil spirits, and the Austrians say that a few grains of salt in the pan will keep the witches from souring the milk. The Greeks gave a present of salt to the gods at each meal; and the Romans considered spilling salt very unlucky. It is a Norwegian saying that the man who spills salt will have to shed as many tears as will dissolve the amount he thus wastes; and the Russian peasants believe that if one gives salt to his neighbor, he will soon quarrel with him.

Salt is so common with us that we can hardly realize its value. It is different in savage countries, where it is hard to get. There are many parts of Africa where it is used as money, as it is also in Tibet and in other out-of-the-way parts of Asia. In some African countries the children like salt better than sugar, and in Abyssinia men carry about little sticks of rock salt and suck them, as we do candy. An Abyssinian man, upon meeting a friend, usually offers him a few licks from his salt stick, just as the American offers a cigar, or, as in the past, a pinch from his snuffbox.

There are mines of salt rock in the Sahara Desert, some distance above Timbuktu, where the salt is taken out in blocks and carried on camels to the river Niger, to be sent to all parts of the Sudan; and in certain other parts of Africa where almost no salt exists, it is said that the butter-

flies and insects will pass by molasses and sugar and light on anything of a saline nature.

The salt of the world now comes from three sources: from the oceans and salt lakes, from mines, and from brine springs. For a long time almost the whole product was made by evaporating the waters of the seas, and this is done to a large extent in many countries to-day. The oceans contain a vast deal of salt. It is estimated that there is about a half ounce of salt in every pound of sea water; and so much in all the oceans that if it could all be extracted and spread over the United States proper, it would cover every bit of the country, mountains, valleys, and plains to a depth of more than two miles, and still leave enough to form a salt bed about a mile deep upon Samoa, Hawaii, Porto Rico, the Philippines, and Alaska.

Sea salt is obtained chiefly in those parts of the world where the hot sun quickly evaporates the water, — for instance, on the island of Madura, in the East Indies, in the Turks and Caicos Islands of the West Indies, on some of the Chinese coasts, and here and there along the shores of the Mediterranean. Sea water is evaporated in large quantities on the shores of San Francisco Bay. It is conveyed into great reservoirs which are so arranged that as the salt water strengthens and decreases in volume, it can be drawn off from one reservoir into another. When the brine reaches the right density it is let out into basins or pools on the bottom of which the salt is deposited in crystals, and, at the end of the season, the salt is gathered up and dried for sale.

Much salt is secured in the same way from the Great Salt Lake. The water is pumped into reservoirs in the

spring, and the sun is allowed to beat down upon it all summer. As the water evaporates and the brine becomes

The salt is gathered up and stacked in piles.

stronger, it is drawn off into smaller reservoirs, more brine being put in from time to time during the summer. The salt gradually crystallizes on the bottom of the reservoir, where at the end of the process it makes a thickness of from three to six inches. The remaining brine is then drawn off, and the salt is gathered up and stacked in large piles on the banks.

Long before man appeared upon this earth, there were seas where the dry land is now. After a time the water evaporated and left salt there. Then came earthquakes and other convulsions of nature which covered these great salt beds with layers of earth; the salt hardened, and in time turned to rock salt. Such deposits are found in different parts of Europe and the United States. One of the largest is

at Wieliczka, near Cracow in northern Austria, where they have been mining salt for seven or eight hundred years. The deposit there is more than twice as deep as the Washington Monument is high. It is twenty miles wide and as long as the distance from New York to Pittsburg. Miles of galleries have been dug through it; and the miners have a village away down there below the surface of the earth. They have houses, a school, stores, and even a church, cut out of the salt.

There are other mines at Salzburg, on the borders of Germany and Austria, where salt was mined in the days of the Romans and where vast quantities are still taken out. I once visited these mines, going far down into the earth and walking for miles through the tunnels cut out of the salt rock. Now and then I came into a chamber where there was a little lake walled and roofed by salt rock. The salt was melted down by letting in water and drawing it off as it turned into brine. After this the brine was run through pipes to the outside and evaporated by the sun or by artificial heat, in enormous tanks, producing the dry salt of commerce.

Other large salt deposits are found in western Germany, Russia, Switzerland, and also in France, Spain, and Great Britain.

In our country we have beds of rock salt in New York, Kansas, Louisiana, and Michigan, as well as in Ohio, Virginia, Pennsylvania, and Kentucky. There is, in New York, far below the surface of the earth, a bed of salt which covers several thousand square miles, and another in Kansas, eight hundred feet deep, where the body of salt is three hundred feet thick. The salt is taken from the Kansas

mines by a shaft which has tunnels running from it out through the salt rock, like the streets of a city, with great

Drilling for blast in a Kansas mine.

chambers cut out of the rock. Here the salt is blasted down by dynamite and is carried on tramways to the shaft. After it reaches the surface, it is crushed and screened by machinery and then deposited in large bins, from which it is loaded on the railroad cars for the markets.

The most of our table salt, as well as that for other purposes, is obtained from brine that is pumped out of these rock deposits. There are salt springs and salt wells in New York and in Michigan which yield thousands of barrels every year. In some of the New York salt works the brine is evaporated in great vats which have movable roofs, so that they can be taken away when the sun shines and put back when it rains. The brine is put into the vats in the spring or early summer and is exposed until the end

of October. As the hot sun pours down upon it, a thin scum forms. This grows thicker and thicker, until it

Salt works in Syracuse, N.Y.

finally sinks to the bottom in salty crystals, to be replaced by other scum as the summer goes on. In the autumn the salt is gathered and prepared for the markets.

We make all together more than twenty million barrels of salt in one year, and more than any other country. In 1900 our production was almost three million tons, while the United Kingdom produced a little more than two millions, Germany, Russia, France, India, and Austria ranking next in order. Our chief salt states are New York, Michigan, Kansas, Louisiana, Ohio, and California.

48. SPICES AND OTHER FLAVORING PLANTS

THERE are certain plants which are used to give an agreeable taste or flavor to food. Some, like pepper and mustard, are of a biting, pungent nature, and are relished with meats and vegetables, cooked in all sorts of ways; others, such as cloves, cinnamon, and nutmegs, are ground to powder and used in puddings and cakes; while others, such as vanilla, form flavors for ices, creams, and confections. Our mustard is the ground-up seeds of the mustard plant of Europe and America; ginger is a root that grows chiefly in the West Indies; and pimento, or allspice, comes from the berry of an evergreen tree which grows at its best in Jamaica.

Pepper is the most important of spices. It is used in every civilized and semicivilized part of the world, and, amongst peoples of hot climates, much of the food is highly seasoned with it. This spice was known to the ancients. The Greeks were using pepper when Alexander the Great conquered the then known world, and it was so costly in Europe during the Middle Ages that men considered a few pounds of it a princely gift. Most of the pepper came then, as now, from East India, Malaysia, and other islands of that part of the world. It was one of the most profitable articles of commerce; and it stimulated the desire for a short passage to India, which Columbus attempted to find when he discovered the New World, and which Bartholomeu Dias and Vasco da Gama were looking for when they made their way about the

Cape of Good Hope and gave us our first knowledge of the extent of the African continent.

It was largely through pepper that the British obtained possession of their great Indian Empire. In the days of Queen Elizabeth the Dutch controlled most of the trade between that part of the world and Europe, and one of their chief imports was pepper, which was selling for about seventy-five cents a pound. This gave a large profit to the Dutch merchants; but, as they had the whole trade, they thought they could get whatever they asked, and they doubled the price, making pepper cost about a dollar and a half a pound. The English merchants protested. But the Dutch would not put down the price; and so an English company was formed in Great Britain to bring pepper and other articles from India to England. This was the famous East India Company, which gradually drove the Dutch out of Hindustan, and finally gave the British government possession of that great peninsula.

Pepper comes from the berries of a climbing plant with large glossy green leaves, which grows to the height of twenty feet or more, but which, under cultivation, is kept down to ten or twelve feet. It is grown from both seeds and cuttings and is usually trained upon poles or upon small trees. The vines begin to bear in the third year after they are planted, and from that time they will each produce annually a pound and a half or two pounds of pepper, for fifteen or twenty years. Pepper plants must have a rich soil and a moist climate, and must be kept clean of weeds. They are set out at about twenty-five hundred to the acre.

The berries are of the size of a large pea. They are green

at first, then red, and when dead ripe, yellow or black. They are usually picked when red and spread out in the sun to dry. After a while they turn a reddish brown or black, and in this shape they form the black pepper of commerce. White

Gathering pepper in Sumatra.

pepper is the seed of the ripe berries, the skin and pulp being removed by rubbing and washing. A great part of the pepper is carried from the various islands adjacent to Singapore, and thence shipped to London and to other markets.

Nutmegs and cloves require much the same climate as pepper, and most of them come from this same part of the world. The chief nutmeg island is Amboina, which lies east of the Celebes Islands, and not far west of New Guinea. The nutmeg is the fruit of a tree that resembles our pear

tree. It has a bright yellow blossom, and the nutmegs, as they hang upon it, are about the size of an apricot; they have the color of peaches and are shaped somewhat like pears.

Each fruit has a thick pulp which splits open, as it ripens, showing a kernel surrounded by a network of crimson mace within. The kernel is the nutmeg of commerce, and the mace is also a spice. In preparing the fruit for the market, the pulpy outside is thrown away, and the nuts are dried slowly in ovens. After this the mace and nutmegs are packed separately for export.

Nutmegs.

Nutmeg trees are grown from the seeds of the ripe fruit. They are set out in orchards and are carefully cultivated. They begin to bear fruit at about ten years of age and continue to produce several pounds every year for a long time. They are grown also in the West Indies and in Brazil.

Cloves are the dried blossoms of a beautiful evergreen tree which grows to a height of thirty or forty feet The blossoms are red when they are picked, but they turn black or brown through smoking over a slow wood fire. This dries them and fits them for the market. They are then packed in bales or in boxes and shipped all over the world, to be used in pickles and in other relishes. Zanzibar

produces four fifths of all the cloves used by man, its exports amounting to millions of pounds every year.

Clove trees are set out in orchards and are carefully cultivated. They begin to blossom about six years after planting, and continue to yield for a great many years. A good tree should produce annually about six pounds.

Cinnamon is the dried bark of a tree which originally came from Ceylon, but which is now grown in Brazil, Egypt, Java, the West Indies, and in the Philippines. The cinnamon tree reaches a height of thirty feet, and its trunk is often a foot or more thick. The cultivated trees are trimmed so that each has four or five stems, which, in about two years, grow to the height of eight or ten feet. At this time each stem is about two inches thick at the bottom and is ready for harvest. It is first stripped of the leaves and twigs, which are dried and sold as cinnamon chips, and then of the bark, which is carefully scraped and dried. As the bark dries, it curls up into rolls, or quills, the smaller rolls being fitted into the larger ones while drying. The bark is tied up in bundles for shipment. It is sold in the quills, and also in a powder for cakes, puddings, and pickles, and as an oil for medicines.

Most boys and girls like gingerbread, and a fresh crisp gingersnap is not bad, I can assure you. The spice used to make these cakes comes from a plant which grows wild in many tropical countries, and is largely cultivated in parts of Asia, Africa, South America, and the West Indies. One of the best places for it is Jamaica, which furnishes a great part of the world's product.

The part of the plant from which the spice is made is the rhizome, which is a stem that grows under the ground

and looks like a root. Ginger is planted by setting out pieces of this root-like stem in the spring. Each sprouts and throws out more rhizomes during the summer, while a plant, at the same time, grows up to the height of three feet or more, and then dies down and withers. When the plant is dead its rhizomes are full-grown. They are then dug up, cleaned, and scalded with boiling water. After this they are spread out in the sun to dry, when they are ready for sale. An extract from them is used for medicine and in ginger beer, and, preserved in sugar, they are eaten as a sweetmeat and also in puddings and cakes.

Vanilla blossoms.

Vanilla, which we use for flavoring cakes and confectionery, comes from the pod, or bean, of a vine which grows wild in the hot regions of eastern Mexico and in parts of South America, and which is now cultivated there and also in the West Indies and in other tropical islands. The vine is of a light green color, with a smooth waxy bark. It has narrow green leaves and a long fleshy fruitlike pod, from which the extract is made.

In Mexico vanilla plants are set out from shoots about

a yard long, a portion of the shoot being under the ground. They are given a rich soil and are usually planted at the roots of small trees, up which they climb as they grow. After this the ground is kept free from weeds, and the trees are sometimes topped, to prevent the plants growing too high. At the end of three years the vanilla vines begin to yield fragrant little white blossoms, and after the blossoms fall, pods spring forth and grow until they are about as large as a catalpa pod. They are gathered before they are fully ripe and are dried in the sheds and "sweated," to develop and fix the aroma. After this the pods are shipped to the markets, where they are made into the vanilla extract that is sold in our stores.

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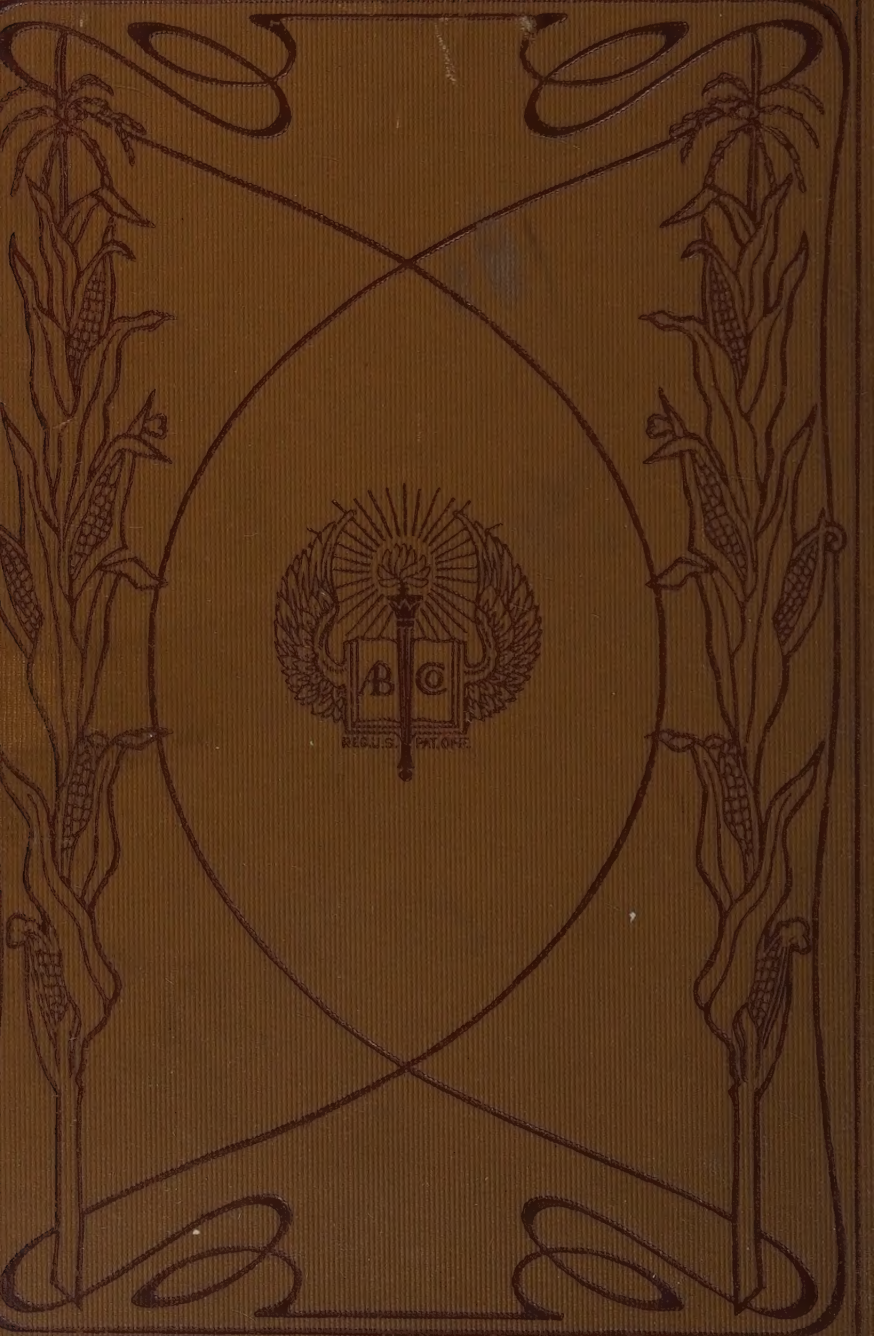
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